THE

JOURNAL OF GAS LIGHTING,

&c., &c.

Vol. LV.—January to June, 1890.

THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

AND

SANITARY IMPROVEMENT.

55086

VOL. LV.

January to June, 1890.

LONDON:

WALTER KING,

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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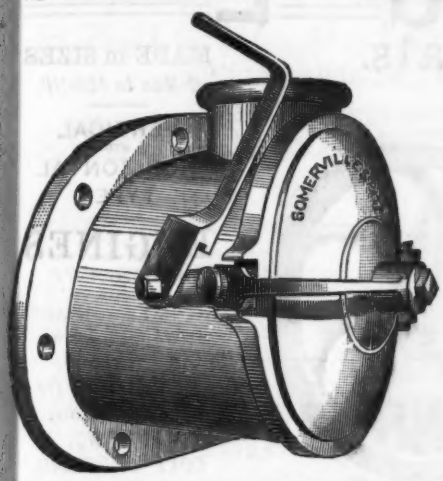

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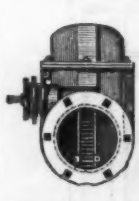

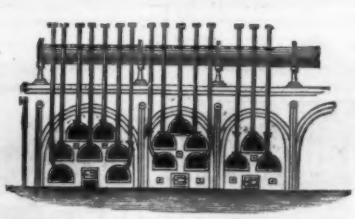

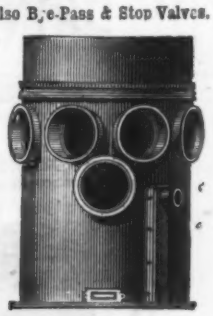

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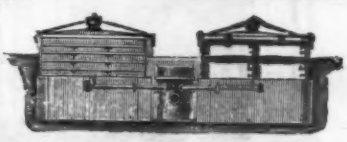

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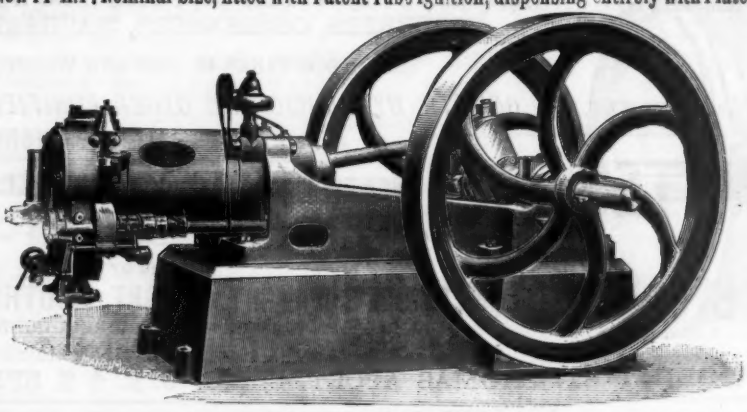

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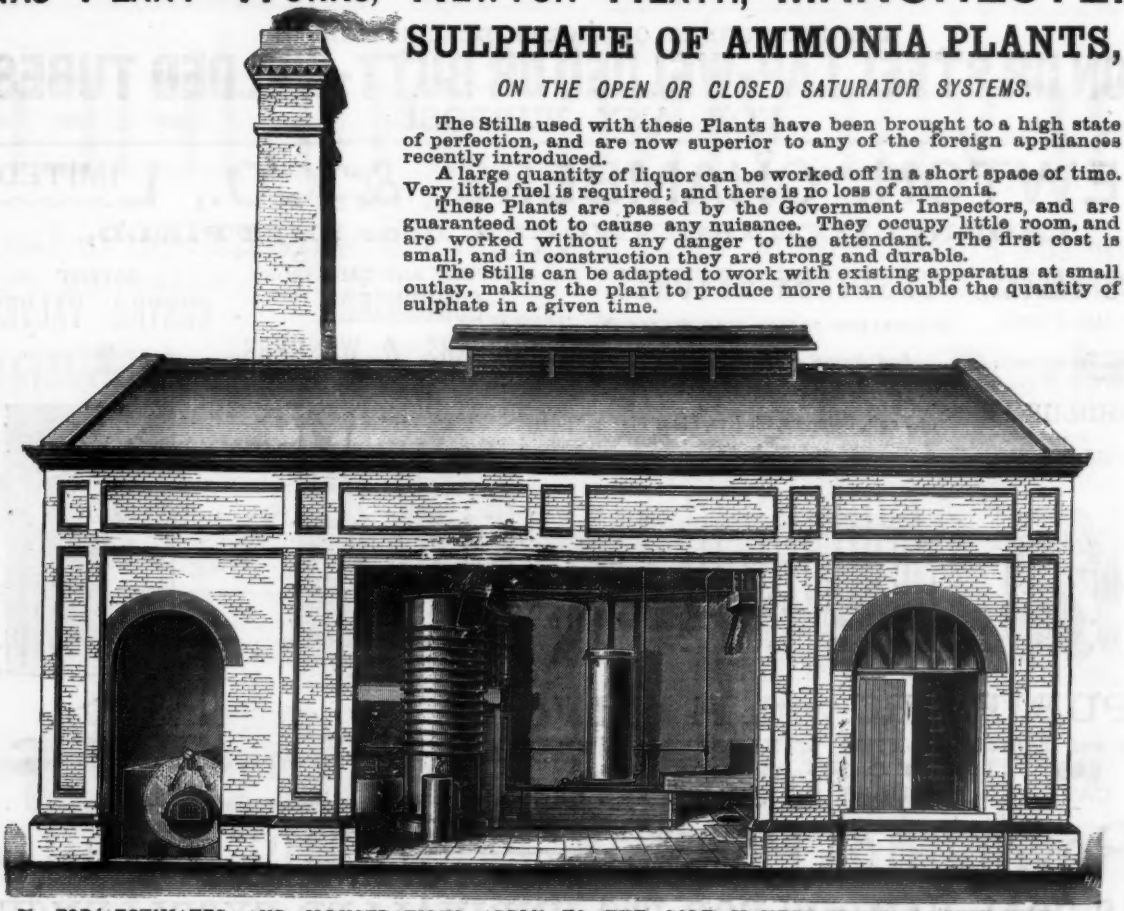

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For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

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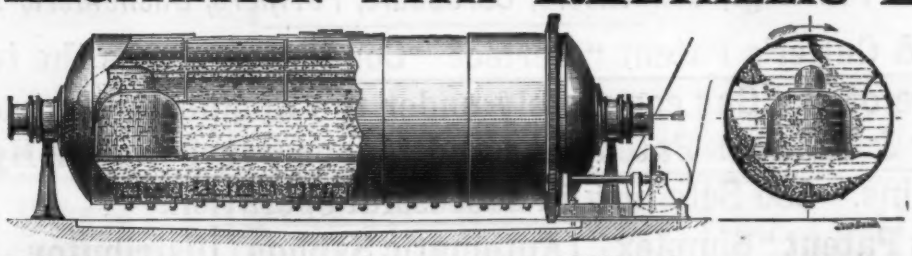

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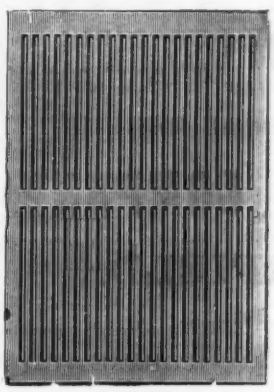

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I am, yours truly, (Signed) G. C. TREWBY.

1. The weight in motion is **only one-seventh** of that in the present Machine.
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5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

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THE "STANDARD" TAR, H_2S, & CO_2, EXTRACTOR.

This Apparatus has been in operation some considerable period at the **Avon Street Station of the Bristol United Gas Company,** where it has been thoroughly tested, and found to give entire satisfaction. Drawings and particulars on application. (*Address as above.*)

TESTIMONIAL.

Bristol United Gaslight Company, Avon Street Station,
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I am, Gentlemen, yours truly,

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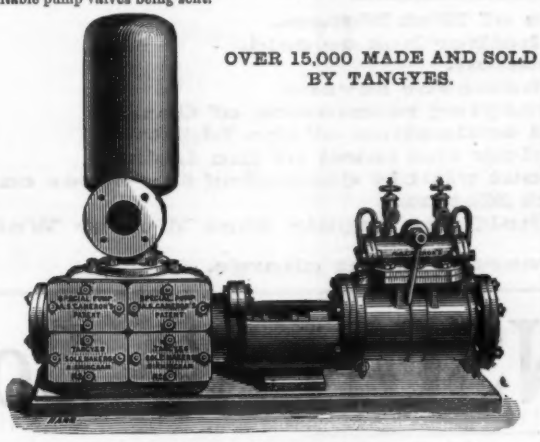
AMMONIACAL LIQUOR, TAR, & WATER IN GAS-WORKS.

Used in the Principal Gas-Works in the United Kingdom.

REDUCED PRICES.

The "Special" Double-Acting Steam-Pump is now made in some 250 sizes, and of many different designs, to suit particular requirements.
In ordering, state the purpose for which the Pump is required, to ensure suitable pump valves being sent.



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In case of Special Quotations, the following particulars are required:—
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The nature of the fluid to be pumped.

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The quantities of Tar delivered should be taken as about two-thirds those of water given below.

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Diam. Steam Cyl. ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl. "	1½	2½	2	3	4	2½	3	4	5
Length Stroke . . "	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.	450	1800	800	1800	3200	1250	1800	3200	5000
Diameter Suction and Delivery . . . ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price . . . . . £	9	12	11	13	15	15	16	19	22

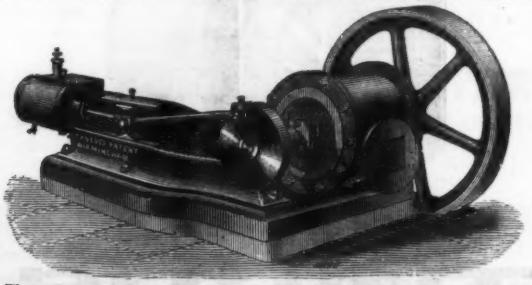
Diam. Steam Cyl. ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl. "	3	4	5	6	3	4	5	6	7
Length Stroke . . "	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.	1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . . ins.	2½	3	3½	4	2½	3	3½	4	5
Price . . . . . £	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl. ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl. "	4	5	6	7	8	5	6	7	8
Length Stroke . . "	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.	3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . . ins.	3	3½	4	5	6	3½	4	5	6
Price . . . . . £	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl. ins.	9	10	10	10	0	10	10
Diam. Water Cyl. "	9	5	6	7	8	9	10
Length Stroke . . "	24	12	12	12	18	24	24
Gals. per hour, approx.	16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . . ins.	7	3½	4	5	6	7	8
Price . . . . . £	56	32	37	42	50	60	67

TANGYES' IMPROVED

ROTARY GAS-EXHAUSTER.



These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

Prices of larger sizes on application.

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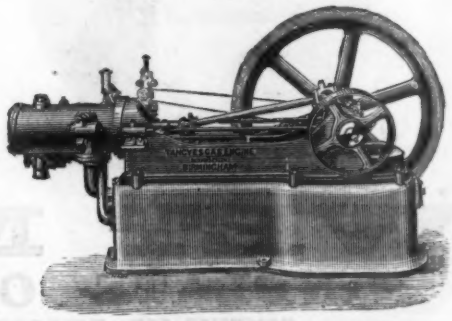
(ROBSON'S PATENT)

Royal Cornwall Polytechnic Special Gold Medal, 1882.

(Also for Gas Producer and Feed Pump.)



The ½, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	½ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works

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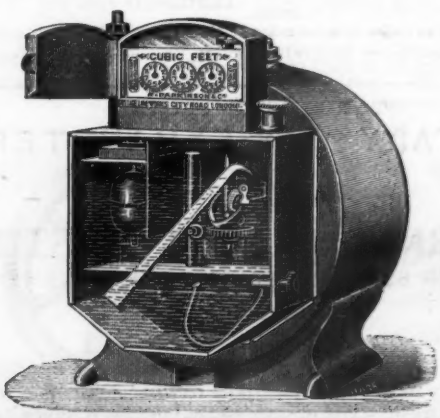

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 7, 1890.

The Gas Strike, and Some of its Lessons.

THE daily newspapers continue to print columns of strike news; a fresh spirit of interest having been given to the subject from the development, during the past week, of the much-advertised attack upon the coal supply of the South Metropolitan Company. When the stokers went out by the orders of the Union leaders, the latter encouraged them by asserting that the Directors would be brought to their knees by deprivation first of gas and secondly of coal. The stock of gas was to have been exhausted in less than four days; and the stock of coal in about three weeks. The task accepted by the Union leaders on behalf of their following was to prevent, by fair means or foul, the replenishing of either of these stocks. The Union Secretary placarded the walls with assurances that the Directors would be unable to keep up the supply of gas for four days from the departure of the old hands, if labourers would only keep away from the works. This first line of attack having failed, in consequence of the completeness of the Directors' arrangements and the co-operation of the police force, which kept the strikers strictly within the limits of that "moral suasion" they are so much more apt to talk about than rely upon, the Union leaders fell back upon their second line of offence—the stoppage of the coal supply. This was to have been effected with the assistance of the three Unions of Gas Workers, Coal Porters, and Seamen and Firemen; and it is understood that the strike leaders have been very busy in the northern coal ports during the past fortnight, concluding their arrangements for the grand combination. Meanwhile, the Gas Company have been steadily getting in coal, just as usual. They had a little temporary difficulty with the Union porters about discharging a cargo or two just when the strike began; but the recalcitrant coalies were soon sent out of the way, and their work entrusted to a sufficiency of sturdy navvies and other labourers, who soon got into the way of it, and rejoiced in the high wages which the Society men had given up. Vessel after vessel left the North without difficulty, except in a few cases easily dealt with; and the threat of the Company to charter German steamers in default of English bottoms was never carried out. In the course of last week some pickets of the coalies succeeded in detaining a steamer or two, and creating a little trouble among the crews; but the Company were able to announce at the end that not a cargo had failed to come to hand. That the Unionists meant mischief is clear from the proclamation which was issued so late as Saturday, in which they refer again to the wild idea of stopping the coal supply of the capital with a view to punishing the one Gas Company who have a difficulty with their men; but from the fact that these maniacal threats go no further, it may be concluded that the Union leaders have not so much power as they have will for evil, and that their supposed constituents, who work while these talk, know better than to bid defiance to all the rest of the community.

The announcement made this week by the Company, that the special strike allowances will terminate on Friday next, merely carries out the plan determined upon from the first. It was arranged to keep the fresh men on the works and ration them for a month; by which time it was anticipated that such of them as were worth anything would be qualified for engagement as regular hands. After this week they will be out of leading-strings, and will have their future in their own hands. Some may prefer to take their bonus back to the country, and others may not be able to resist the seductions that will be brought to bear on them when free from the salutary discipline of the gas-works. Many a poor misguided stoker who now sees Messrs. Thorne, Hutchins, and Co., in their true light, is building upon this chance of getting back to the works; and nobody can find it in his heart to wish that those who sincerely repent and see the error of their ways may not find room and reception in the Company once more. There is no rancour on the part of the Directors against these wretched victims of professional agitators. Over and over again has Mr. Geo. Livesey declared the willingness of the Board to meet "their own men" in any possible way; but with righteous sternness the Directors ignore the Hutchinses and other strangers who have forced themselves into the Company's affairs If the South Metropolitan stokers were in need of advisers other than their own employers, and had chosen Thorne, Hutchins, and Co., for this office on account of their known wisdom, truth, and identity of interest with themselves, it would be possible to comment on the proceedings of these men in a different tone. As a matter of fact, however, neither Thorne nor Hutchins had any act or part in the concerns of the South Metropolitan Gas Company or their men; and they have no qualifications such as might excuse their intervention and dictation. It is a wretched business, redeemed only by the tacit approval with which the respectable portion of the public support the Gas Company in their resistance to these tawdry tyrants.

No more instructive commentary upon this new development of Trades Unionism has been contributed to the general literature of the affair than the remarks of "An "Old Trades Unionist," given in our last issue, from the *Evening News and Post*. It is not every fantastic charlatan dubbing himself a Trades Unionist who is worthy to be regarded as an authority on Union principles; yet such is the view apparently adopted by some of our younger newspapers and notoriety-hunters. If a man has been identified

with a certain cause for a whole lifetime, that is considered quite sufficient reason by "advanced" people for calling him old-fashioned. Probably the man Wier, who now awaits his trial on the charge of inciting a crowd at a mass meeting to murder Mr. George Livesey, belongs to the "advanced" section of the Compositors' Society, in which he was a small official. There is comfort in the thought that rawness, incapacity, and hollow pretensions must come to grief in the end, although, as in the case of the officials of the Gas Workers' Union, they may hoodwink people for a time. It is perfectly true, as the "Old Trades "Unionist" says, that the leaders of the Gas Workers' Union have "committed every mistake they could commit, "and were wrong from top to bottom;" and it is as well that this should be pointed out by somebody who cannot be accused of ignorance or dislike of Trade Union principles. Perhaps in time the good gentlemen who are at present not ashamed to do a little gentle truckling to these discredited pretenders, for the sake of their own peace and comfort, may before long repent their subserviency and obliviousness of principle.

The current developments of the strike are sufficiently recorded in another column; and it is therefore unnecessary to say anything here about the proclamations and counter-proclamations, moves and reprisals, and other incidentals of the conflict. There are many indications, besides the violent language of the strike leaders, that we are in view of the end of the trouble. Whether or not one result will be the break-up of the Union—and this is extremely likely, seeing that the stokers of other gas-works than the South Metropolitan are likely to grow tired of paying for the support of men who have failed in Manchester, Salford, South London, Woolwich Arsenal, and Norwich—it will be instructive to discuss one or two of the features of the style of Trades Unionism which Mr. Thorne and his friends have invented. The most salient principles of this variety of workers' combinations are: First, the irresponsible power of the leaders; secondly, intolerance of non-Unionists in he same employ; lastly, the use of the Irish-American inventions of boycotting and consequential vengeance. There is evidence to show that when a man had once joined this Union he was not considered free to leave it; and the right was assumed of requiring an employer to discharge a quondam Union man who would not pay up his Society subscription. With regard to the power of the leaders, it is on record that the Manchester strike was ascribed to the rashness of the Branch Secretary—as though it was the most natural thing in the world that a pushing nobody of this order should have it within his discretion to say whether the supply of light to a town should be jeopardized, and the livelihood of hundreds of his fellows endangered! We should much like to learn, moreover, how the views of the majority of those most interested (say) in such matters as the rejection of the South Metropolitan bonus and the consequent strike, or the strike at Woolwich Arsenal, were obtained. Was there anything like a ballot taken? It would be found on investigation that the action of the Union leaders in all these matters has been of the most arbitrary kind. With regard to the intolerance shown by the Union to outsiders, this is only intelligible on the supposition that the leaders entertain some ulterior design for the benefit of their followers, in which they are not disposed to allow non-Unionists to share. What this benefit was intended to be to begin with, is clearly exposed by the South Metropolitan Directors' notification to their consumers. Mr. Mark Hutchins and his associates deny, with their usual effrontery, that the object of the Union is to raise the wages of Unionists. But they speak without book; for at the first reported mass meeting in connection with the movement, Mr. Thorne himself said as much; and if the subject has not been kept in the front of late, it is only because it was felt that the way should first be cleared. There can be no shadow of doubt that if the South Metropolitan Directors had not resisted the Union when they did, by this time they and the Chartered and Commercial Companies would have had to face a simultaneous strike for a 25 per cent. advance on retort-house men's wages. This movement would have spread from London to the country; and if it should now be dropped, it will not be through the effect of soft speeches to Union leaders, but because these gentry were foolish enough to stake the existence of their organization on a demand which the common sense of the community regarded as tyrannical, and the South Metropolitan Directors had backbone enough to reject at all costs. As to what we have called the Irish-American introductions into this so-called trade dispute, it will be sufficient, by way of explaining our meaning, to refer to the proposed stoppage of the coal supply of London, the wild demands for the boycotting of the bakers who made the bread bought by the Company for feeding their new hands, and the other collateral projects which have recommended themselves to the strike leaders and their party. Surely, the doctrine of consequential liability was never pressed to such lengths anywhere out of Tipperary. Fortunately for the repose of Society, which might otherwise have been startled by news of plots to punish the South Metropolitan Gas Company by cutting the mains of the Water Companies, the Government appear to have awakened to the fact that the law of conspiracy is not yet a dead letter. Of course, the "popular" newspapers howl at the Home Secretary for this; but Mr. Matthews's position has been much strengthened in serious public opinion by his judicious interference, or non-interference, in the great gas strike and its developments. These matters, as we remarked before, are worth thinking about; and if the vagaries of the Gas Workers' Union managers have the effect of inspiring working men with a wholesome distaste for committing the interests of themselves and their families to the irresponsible hands of demagogues who order strikes, in which they will not be personal sufferers, without consulting those who have to "stand the racket," then the pain and loss of the present struggle in South London will bear at last as good fruit for the workman as it undoubtedly has already borne for the gas interests and employers of labour generally.

Municipal Gas Management in England and America.

In a recent issue of an American magazine there appeared an article in favour of the acquisition of gas undertakings by the municipal authorities of United States towns, which is chiefly remarkable for the answers suggested by those who know by experience what American municipal control of gas undertakings really means. It is curious to mark the different criticisms that a suggestion of this order would naturally evoke on the two sides of the Atlantic. With us it is customary to plead, when any particular gas undertaking is desired by a local authority, that the supply would be better if in public hands; and that the profit from a monopoly of gas supply rendered profitable by the concentration and prosperity of a community in a certain district, ought to belong to the community itself, and not to a trading company. On the other side, it is argued that, as a matter of fact, gas supply is better managed by trading companies than by elective corporations; and that the administration of gas undertakings by the latter invariably means dearer gas and a less perfect control over illuminating power and purity than when the supply is not a municipal responsibility. We also say that the designed relief of rates in gas-supplying towns out of the profits of the gas undertaking is unjust in principle and mischievous in action—that it rates certain members of the community higher than others, and that the subsidies paid to municipal treasuries from this source are generally squandered to little effect. Until the Salford affair came into prominence, the idea of positive corruption in respect of the management of public gas-works property was hardly entertained in this country. We were accustomed to think of our municipal magnates as often presumptuous, meddlesome, incompetent, and self-seeking in the political sense; but not as openly venal. At that time, however, uglier rumours began to circulate, and it was more than hinted that some of the great unpaid administrators of municipal gas undertakings did not suffer pecuniarily for their sacrifices of private business to the duty of seeing that the corporation orders for supplies of the raw material of gas making were well placed. We are not going to inquire whether all the grounds for these disquieting rumours have actually been removed; but it is at least possible to say that nothing like the cynical abuse of public trusts to further private ends which is openly charged upon many United States municipalities, could be practised for a day in the United Kingdom. What we may come to in course of time, it is impossible to say; but it is enough to make the most confirmed worshipper of an unmitigated Democracy pause when he sees what is done in the name of local self-government in the Great Republic. For what is the immediate comment on such an apparently impersonal and non-political proposition as that of the placing of gas

supply under municipal control? Let us quote a contemporary. The magazine writer refers to the precedent of water supply by municipalities as being free from "vicious "management;" whereupon *Light, Heat, and Power* remarks that if vicious management includes "reckless waste of "municipal moneys, placing of dummies on pay-rolls, "intimidation of *employés*, forced collections of percentages "of honestly-earned wages for political funds, displace- "ment of competent heads of departments because they "would not violate the laws and their official oaths, and "other things of this character—or lack of character—we "can find all these. . . . These matters are part and parcel "of the history of Philadelphia." As to the gas supply of the city—the most American of all American cities—it has been placed upon record that the object of the Gas Trust was to manufacture voters; gas being only a bye-product. The result of all this is summed up by our contemporary in the statement that "so long as partisan politics decide "the Government of American cities, must the under- "workers be provided for; and this is detrimental to the "lessening of expenses in any department." The committal of the care of public gas property to trustees elected for life, or turning them over to private management, is named as the only escape from a course of corruption which is asserted to grow with opportunity. If this is a true picture of the result of Western progress in municipal government, it will be thought elsewhere that the experimental constitution of the United States has gone wrong, at least in this respect.

The Cost of Natural and Coal Gas Compared.

THERE appears to be some trouble between the purveyors and consumers of natural gas in a number of towns in the States of Ohio and Pennsylvania, where in some cases the supply is running short—necessitating an increase of rates; and in other towns the same result has followed from other causes. In connection with these disputes, the charges made for natural gas before the advances were determined upon, have been published in the *American Manufacturer*, whence we may gather some particulars interesting to suppliers of coal gas for cooking and heating purposes elsewhere. Thus it appears that the lowest yearly charge for a "cook-stove"—capacity not stated—was as low as $16, or (say) £3 4s., in two towns, rising to $32, or £6 8s., in two other towns. As to this, it may be said that if the former was a little under the average cost of gas cooking for a family for a twelvemonth in an English town, the latter is decidedly above it. The cost of "heaters" ranged from $8 to $24; but, in the absence of any particulars as to the power of the stoves in question, it is impossible to compare their cost with that of ordinary gas-stoves in England. The same remark applies to what are described as stoves and hot-air furnaces, which are listed in different sizes, but do not correspond to anything within common experience on this side. Stores and halls of 50 square feet of floor surface appear to be warmed by contract at from $18 to $24·70 per annum, with a provision for extras. On the whole, looking over this schedule of charges for a fuel that is supposed to cost nothing to the purveyor, it does not appear that householders in the districts included could get their "natural" supplies of cooking and heating power very much, if at all, cheaper than people in towns in the United Kingdom supplied with what would be called fairly cheap gas. Apart altogether from the large factories having wells of their own, or supplied on special terms, it thus becomes clear (which we have long suspected) that when the cost of the real estate has been added to the expenses of boring, collecting, distributing, and administration, natural gas becomes nearly as dear in many places as it is worth. It is tolerably safe to declare that there are not many towns in the natural gas region of the States where the ordinary householder gets his supply of gaseous fuel noticeably cheaper—value being considered—than coal gas is in many British towns.

Our "Retrospect" of the events of the past year, in the last issue of the JOURNAL, requires a slight correction in the portion dealing with the dispute between the South Metropolitan Gas Company and their workmen. It was there stated that the Union hands sent in their notices twice, and each time gained their point. This was true as far as the sending in of the notices was concerned; but it was only on the first occasion that the men's demands were conceded. They were told immediately afterwards that the next time they gave in their notices they would be accepted; and this was done.

ESSAYS, COMMENTARIES, AND REVIEWS.

SOME REFLECTIONS ON THE STRIKE.

THE condition of the British and especially of the Metropolitan gas industry with regard to workmen employed in carbonizing, naturally draws attention to all the circumstances of this employment. During the past few weeks we have seen the gas supply of Bristol, Manchester, Salford, South London, and Woolwich Arsenal more or less jeopardized by strikes which can hardly be regarded as preventible by any imaginable exercise of prudence on the part of the managers of other gas undertakings in the country. Whatever might be said of one or two of these examples, the others have been purely gratuitous displays of the intractability of trained labourers under the stimulus of a new sense of power through combination. The men have received a sharp lesson in these cases; but it is a curious feature of the development of the Gas Workers' Union that the loss of one branch of the organization is almost unfelt by the rest. This would not be the case with a Society composed of highly-trained and intelligent mechanics, among whom every vicissitude of the organization would be propagated from end to end of all its branches. To judge from what has happened in Norwich lately, and the talk about calling out the Union men in the employ of The Gaslight and Coke Company, which has so far happily gone no further than talk, the Gas Workers' Union partakes more of the character of those lowly organisms in Nature the members of which have a semi-independent existence. Injury to a remote limb does not necessarily kill them, or even warn another limb from incurring the same danger. Thus, for as long as the Gas Workers' Union remains in existence, outbreaks like those already recorded may be expected. The supreme Executive may disown them, as they did the Manchester attempt, and blame a too-zealous branch secretary; but the effect is the same for the men and their employers. In the probability therefore that unless the organization should be killed outright as a consequence of the South Metropolitan struggle, sporadic strikes due to its influence, direct or indirect, may be expected anywhere and at any time, it behoves those who are responsible for the maintenance of the gas supply of large towns, to think how they are circumstanced in view of such an eventuality.

We say no more here about the many projects for abolishing or reducing the amount of trained labour required for the present system of gas making by the adoption of new methods of carbonization. This movement has doubtless been started, and will be considerably helped by remembrance of the labour crises of the past autumn; but it must necessarily be slow, for the most promising of new processes could only be adopted in gas-works tentatively. If a system of inclined retorts, or even of auxiliary water-gas plant, were to be ever so widely patronized by British gas managers in the next building season, it would be at least two years more before it would grow into sufficent preponderance to seriously affect the routine of gas manufacture. It is the organization of the working staff in the present that demands attention, in view of such an emergency as that through which the Manchester and Salford Gas Committees and the South Metropolitan Gas Company have just struggled, not without damage. With regard to the terms of stokers' engagements, for instance, inquiry would reveal remarkable discrepancies in different gas-works in the same country. The weekly hiring for weekly pay may be the general rule in the south; but many hundreds of stokers have a fortnightly engagement. It is abundantly clear by this time that a fortnight, much less a week, is not long enough for a gas company to make ready for a strike. From the employers' point of view, a month's notice is essential; but then the workman would argue that such a long notice practically takes away all the force of a strike. It is a question, of course, whether a strike should ever be permitted in connection with gas supply, which is so vital for the safety of towns. Strikes may be fair weapons in some industries; but the line must be drawn somewhere. As has been very pertinently pointed out, the firemen and sailors employed in an ocean steamer may strike if they like when ashore; but even if irritated by the offer of a share of the profits of the ship, they could not be permitted to stop working while at sea. Now a gas or water company is always in this predicament, with the safety and life of the community dependent upon its regular discharge of the objects of its charter. Apart altogether from the interests of the employers or of the employed in these industries, it is therefore a matter of public concern that nothing shall be permitted to interrupt the service. If the men are justified in stopping gas or water supply with the object of gaining some private advantage for themselves, it is difficult to see why similar liberty should not be permitted to the employers. In connection with repairs of plant, &c., it often happens that gas manufacturers are put to great cost merely in order not to stop the supply for an hour or two. This condition is accepted as a point of the charter; and it has to be proved that a similar disability might not be imposed on the men, by their being engaged under terms which should place striking out of their power.

Practically this is done by some gas companies who require their winter hands, as they come on, to sign an agreement for service for as long as they may be required—that is, for the season. The comparative advantages of this system of hiring as against quarterly engagements, may be arguable. It appears

that the whole question of the terms of gas stokers' hiring needs inquiry, in order that some general understanding on the subject may be arrived at. We are advocates, as we have always been, of everybody employed in a gas-works being paid at the highest rate reasonably due to his grade according to the custom of the locality. Hitherto, if anybody has been underpaid in British gas-works, it is certainly not the stokers. Their recent demand for higher pay for Sunday work is a perfectly legitimate one; and it will probably have the result of bringing many hitherto dull directors to see the necessity of plenty of storeage capacity as a means to the reduction of Sunday labour. Next season is accordingly likely to be a busy time for gasholder makers. So far, the outlook is satisfactory; but a resettlement of the position of stokers and gas workmen generally, with the avoidance of the contingency of a strike, is desirable before next winter's hands are engaged.

A subject that is also likely to receive special notice, in consequence of recent troubles, is the existing differences in carbonizing work in different places. Why is it, it may be asked, that retorts are charged with the scoop in some places and in others with the shovel? Some scoops again are large, and others light. The arrangement of the retorts in the arches is such as to make stoking more arduous in some works than in others. The old ovens, taking a large barrowful of coal and more, may still be in use in a few works, where accordingly the stoker is of a different stamp from the modern scoop-driver. Stokers themselves discriminate very finely between different methods of scoop charging. There is "side work" when the scoop is filled while lying parallel with the front of the bench, needing accordingly to be turned through a right angle, as well as lifted, before the retort can be charged. "Straight work" is a term that explains itself, meaning that the scoop has not to be turned but only lifted to the level of the mouthpiece when filled. With the exaggerated idea of the value of their own work that many men of the uneducated classes entertain, a stoker habituated to "side-work" scorns the notion that he who has only been trained at "straight work" can fill his place. An outsider who might entertain the opinion that gas stoking is the work of unskilled but trained and disciplined labourers, would be very speedily enlightened as to his blunder, from the stoker's point of view, if he were to ventilate such opinions in a London retort-house lobby. It is a sober fact, that the majority of the men who turned out from the South Metropolitan Gas-Works three weeks ago were firmly convinced that none could take their places, and that the holders would be aground in something less than three days. This was not merely due to hopefulness, and overweening confidence in their leaders, but chiefly to the remarkably high opinion the men entertained of their own skill as handicraftsmen. Everybody has heard of the scorn displayed for a plain, straightforward street sweeper by the artist who can make a neat finish of sweeping round a post; and the gas stokers have supplied an example in point. They truly believed, and were encouraged in so believing by Thorne and Hutchins, that no able-bodied man, though inured to stoking marine or land boilers, or to furnace work in the iron, glass, or pottery trades, could take up gas stoking even passably in less time than would bring the South Metropolitan holders to the ground. Nay, even if a stoker had been used to "straight work" with the scoop, the South Metropolitan work, being mainly of a different character, was confidently expected to prove insurmountable by such a recruit. How these anticipations were falsified is matter of history. Although in the majority of cases quite strange to gas making, the South Metropolitan recruits tackled the scoop and rake like men; and with all their slowness and blunders were only about 40 per cent. behind the old hands when the first day's output came to be measured.

It was different in Manchester and Salford. Here the make was very poor for the first few days; and assuming the character of the raw material to have been equal to that obtained for the South Metropolitan Company, we must look to something else for an explanation of the greater difficulty experienced in the northern works in approaching to the normal rate of production. If the men were equally good and well managed, then the plant in the one case must have been more difficult for green hands to deal with or must have been defective in some way. This way of looking at carbonizing plant introduces a new standard into gas-works construction which should never again be lost sight of—the standard of manageableness by inexperienced men in an emergency. Would it be a mistake to declare, as the general result of the Lancashire and Surrey strike experiences, that the stage-house and the scoop have beaten the ground-floor house and the shovel? The stage-house is much less arduous to work, so far as the stokers are concerned; and if the work in the coke-hole is pretty hot, it can be done more at leisure, and fewer men suffer from it. Drawing is harder work for new hands than charging with the scoop; but if the red-hot coke falls clear away down from the stage and they have not to face it, as with a ground-floor house, the strain is necessarily lessened. Shovel charging, again, entails more continuous exposure to the heat of the retort-bench than charging with the scoop, as well as more skill. If we are justified in assuming that stage-houses and scoops characterize the South Metropolitan works while ground-floor houses and shovels rule in Manchester and Salford, it would appear that the quicker re-establishment of something like the normal rate of gas production in the southern works is explained.

It is with no desire to lay down a hard-and-fast rule in this matter that we make these comparisons, which may, of course, be capable of explanation in quite another fashion. The difference between stage and ground-floor retort-houses is such a striking one, that an engineer who happens to prefer the former, notwithstanding its extra cost per mouthpiece, may find in these remarks some additional proof of the superiority of the former. Apart from the question of the occasional necessity for the employment of unskilled hands, if it can be reasonably shown that the one kind of house strains the stokers less than the other, this is sufficient argument for its adoption. Nobody would deliberately weigh a few more sovereigns of capital expenditure against the lives of men. The choice between the scoop and the shovel, however, is not a question of money, but of custom. The rightful conclusion of the comparison we have made between these tools may be left to our skilled readers as one of the minor lessons to be drawn from the great strikes.

ELECTRIC LIGHTING MEMORANDA.

The Dangers of Electric Light Wires; Mr. Westinghouse's Reply to Mr. Edison—Destruction of the New York Edison Station by Fire—Extension of the American Panic Respecting Electric Light Wires—The Progress of the Metropolitan Electric Supply Company.

THERE is little talked of at present, in connection with electric lighting, but the dangers of exposed wires. We noticed recently the communication on this subject which Mr. Edison sent to the *North American Review*, arguing that all high-tension currents are inherently unsafe. As this declaration struck directly at all methods of electrical distribution except Mr. Edison's own, which he claimed at the same time to be perfectly innocuous, it was felt to be a challenge to his competitors in the native electric lighting industry. The most conspicuous of these rivals in trade —Mr. George Westinghouse, jun.—lost no time in replying to Mr. Edison's charges. This was very bold of him, seeing that his own system of high-potential alternating currents is universally recognized as the most deadly of all. It must be conceded, moreover, that Mr. Westinghouse makes a very good defence. He does not attempt to deny the danger of high-potential currents, but carries the war into the enemy's country by asserting that Mr. Edison's famous low-potential current is in reality just as dangerous as any other. "I have witnessed the roasting of a large piece of fresh beef by a direct continuous current of less than 100 volts within two minutes." This statement should not only confound Mr. Edison, but also open up a new field of labour for him. Why wait for hours for the cooking of a dinner if the work can be done by a new form of electrical gridiron in less time than is required for laying a dinner-table? Mr. Westinghouse goes on to show that, notwithstanding all the uproar that has been made concernnig these casualties, the number of deaths in New York in 1888 directly traceable to electric currents, is insignificant as compared with those caused by street accidents and even by illuminating gas. Without accepting these statistics as unquestionable, it should be remarked that this method of arguing the case is essentially weak. The alarm felt by the public respecting a source of danger to life, is irrespective of statistics. About one person is killed daily in the London thoroughfares, without frightening the remainder of the population, who rightly regard the manitold risks of the streets as inevitable. Let steam-boilers, or any other industrial appliances worked for trade purposes, sacrifice one-tenth of this number of victims, and a cry for inspection and prevention would immediately arise. Wherefore electricians need not persuade themselves that they may kill a few people every year without blame, because the ordinary street traffic kills in the aggregate a great many more. The public are resigned to the dangers of the streets, which they cannot help, and which the press of population tends to increase; but that is no reason why electricians should be permitted to deal death and destruction by wires bringing them revenue.

Curiously enough, in the course of his comments upon Mr. Edison's *Review* article, Mr. Westinghouse remarked that "the fire risk from electricity is the one most to be feared;" and he pointed out that Mr. Edison's own continuous-current system is especially dangerous on this account, because "whenever there is occasion to put out a number of lights by the movement of a switch, it not unfrequently happens that a dazzling arc of blue flame is formed which has to be blown out." On Thursday last —rather more than a month from the first appearance of these words in print—the New York "down-town" station of the Edison Electric Light Company was completely destroyed by fire. The loss amounts to £20,000; and the lighting must necessarily be interrupted until the mains can be connected with a temporary generating station, or until the premises can be rebuilt. It is very significant, bearing in mind Mr. Westinghouse's criticism, that the telegram announcing the fire, which appeared in the London papers on Friday last, states that it "started in the dynamo-room; but how it broke out is unknown." Perhaps that "arc of blue flame" had something to do with it. At any rate, Mr. Edison has apparently been punished for his own pretensions to superior safety, quite in the regulation manner of what is known as "poetic justice."

The same day that brought the news of the destruction by fire of the original model Edison lighting station also signalized an outbreak of excitement in St. Louis over electric lighting wire

accidents. There had been a very heavy rainstorm the previous day and night, which wrought havoc among the electric wires carried anyhow, in the usual slovenly fashion, on rickety street poles. Consequently, the lighting wires became mixed up with others, and fell to the ground, with the usual startling results to all wayfarers who happened to come into contact with them. Only a dog and a horse were killed outright; but several people were more or less seriously injured. What makes these wire "accidents" so peculiarly horrifying to the public is the awful suddenness of the casualties, and the mystery with which they are surrounded at the outset. When the first victim is struck down, the natural impulse in the bystanders is to rush to the rescue; and usually several are affected before the true nature of the disaster is perceived, and its cause detected in the innocent looking wire. It is scarcely to be wondered at, therefore, as these accidents become more frequent with the wearing of the wires which have seen a few years' service, that this drawback to the advantages of electric lighting is beginning to loom very large in the startled eyes of American town residents.

The second ordinary general meeting of the Metropolitan Electric Supply Company, of which Sir John Pender is Chairman, has just been held, when the principal business was the delivery from the chair of a statement as to the progress of the Company in the matter of making provision for the supply of their large district. It was remarked that the Company earned £6127 during the year, chiefly from the lighting of their small Whitehall district; but nothing was said about the expenditure upon this branch of the undertaking. It might be thought that a business of this magnitude would furnish data upon which to base an opinion of the Company's prospects; and it is perhaps for this reason that nothing of the kind is allowed to transpire. It is the system of this Company to supply distinct districts from particular stations; wherefore it would seem that every one must stand on its own bottom as a separate undertaking. It is claimed that the Whitehall station is worked to nearly its full capacity, and is therefore earning nearly as much money as it will ever do. The suppression of all information concerning its real financial position is therefore the more remarkable. The Sardinia Street (Lincoln's Inn Fields) station was described as having been started to work on September 21 last, and to be now serving 7000 lamps, with engagements to supply 5000 more by the end of the season. This being the full capacity of present plant, it is to be duplicated forthwith; but here, again, there is no working statement. It is asserted that the lights already supplied from the Whitehall, Sardinia Street, and Rathbone Place stations will produce a revenue of £20,000, to be almost immediately increased to more than £30,000; but this is only the Managers' estimate—and we all know by this time what electricians' estimates are worth. The Chairman declared further that when the present capital of £500,000 is fully employed, the Company will be supplying 100,000 lights, and earning at least £100,000 per annum. But what of the other side of the account? If we could know exactly what it costs to earn the first £6000 of this anticipated revenue, we might be able to form an idea respecting the probable appearance of the Company's revenue account, when they shall have entered into their inheritance; but, wanting this advice, it is idle to talk about prospects from estimates of revenue alone.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 33.)

THE old year went out with a surprise, for on almost the last day of it (and a Monday too) the Bank of England raised its rate to 6 per cent., much to the satisfaction of the prophets who had seen it coming every day for months past. Stock Exchange prices were not so much affected as they generally are by such a rise; for, in spite of it and of the slackness of the season, the generally tendency was firm. Business in Gas as in other markets was only moderate; and prices showed very little variation from the close of the week before. In Gaslights, "A" opened rather weaker, and fell 1—being done at 246. But it recovered the point later on; and Saturday's mark, of 249, was the best of the week. A cheap sale of some 10 per cent. preference also on Monday put that down slightly; and though a better price was marked later, the quotation stopped where it fell. In South Metropolitans, "B" was speculatively put down 1 on Monday; but prices of transactions subsequently were well up to the mark. "A" was in good demand, and fetched top rates. Commercials were unchanged. Suburban and Provincial undertakings have been very quiet, and present no special feature. The Foreign division have been moderately dealt in; and good prices have been marked in Buenos Ayres, European, and Monte Video. But nothing has changed in point of quotation except Buenos Ayres debentures, which are 3 better. Water stocks have shown some sign of reanimation; and a noteworthy incident is the progressive advance in public favour effected by the debenture stocks.

The daily operations were; Gas was quiet and rather weaker on Monday; Gaslight "A" and South Metropolitan "B" falling 1 each. Tuesday was much the same. Gaslight 10 per cents. receded. Wednesday was a holiday. On Thursday, Gas was very active, and prices generally were inclined to be better. On Friday, the general run of figures showed no falling off, though business was slacker. On Saturday, the firmness progressed, and Gaslight "A" rose 1. Debenture stocks of East London, Lambeth, and New River advanced as noted on p. 34.

In accordance with our usual practice, we append a comparative table of the quotations of Gas and Water securities at the close of 1889, and as they were twelve months previously. The causes which have depressed (temporarily depressed, be it said) Gas stocks must be present to all minds, and need not be referred to further. Water stocks, almost without exception, have improved. Chelsea, East London, and Lambeth have paid higher dividends; but the ratio of improvement in quotation is not in every case commensurate with the increase of dividend.

NAME.	Prices on Dec. 31, 1888.	Prices on Dec. 31, 1889.	Gain or Loss.
GAS COMPANIES.			
Alliance and Dublin Company, 10 per cent. maximum	18½—19	17—18	−1½
Do. 7 per cent.	12½—13½	12½—13½	—
Australian (Sydney) 5 per cent. Debentures	112—114	110—112	−2
Bahia, Limited	21—25	20—21	−4
Bombay, Limited	6¾—7¼	6¼—7	−½
Do. New	5—5¼	4¾—5	−¼
Brentford, Consolidated	223—228	218—223	−5
Do. New	164—168	158—163	−4½
Brighton and Hove, Original	43—45	41—43	−2
British	43—45	43—45	—
Bromley, Ordinary 10 per cent.	19—21	19—21	—
Do. 7 per cent.	13—14	13—15	+1½
Buenos Ayres (New), Limited	13½—14½	13—14	−½
Do. 6 per cent. Debenture	110—112	107—110	−2½
Cagliari, Limited	26—28	25—27	−1
Commercial, Old Stock	257—262	242—247	−15
Do. New do.	209—214	195—200	−14
Do. 4½ per cent. Debenture Stock	122—125	117—122	−4
Continental Union, Limited	44—46	47—48	+2½
Do. New 1869 and 1872	30—32	32—34	+2
Do. 7 per cent. Preference	36—38	36—38	—
Crystal Palace District	205—215	200—205	−7½
European, Limited	25½—26½	22—24	−3
Do. New	18—19	17—18	−1
Do. do.	12—13	11—12	−1
Gaslight and Coke, A, Ordinary	248—252	244—249	−3½
Do. B, 4 per cent. maximum	100—105	100—105	—
Do. C, D, and E 10 per cent. Preference	258—263	248—253	−10
Do. F, 5 per cent. Preference	125—130	123—128	−2
Do. G, 7½ per cent. Preference	182—187	182—187	—
Do. H, 7 per cent. maximum	167—172	157—162	−10
Do. J, 10 per cent. Preference	256—261	247—252	−9
Do. 4 per cent. Debenture Stock.	117—120	112—115	−5
Do. 4½ per cent. Debenture Stock.	122—127	121—125	−1½
Do. 6 per cent. Debenture Stock.	170—175	160—170	−7½
Imperial Continental	204—207	213—218	+10
Malta and Mediterranean, Limited	5—5½	5—5½	—
Metropolitan of Melbourne 5 per cent. Debenture Stock	114—116	113—115	−1
Monte Video, Limited	19—20	18½—19½	−½
Oriental, Limited	9—9½	8½—9	−¼
Ottoman, Limited	6—7	5½—6½	−½
Pará, Limited	5½—6½	3⅝—4⅜	−2
People's Gas of Chicago, 1st Mtg. Bds.	104—107	100—105	−3
Do. 2nd do.	92—97	95—100	+3
San Paulo, Limited	15½—16½	14½—15½	−1
South Metropolitan, A Stock	297—302	295—305	+3
Do. B do.	232—236	228—233	−3½
Do. C do.	245—255	240—250	−5
Do. 5 per cent. Deb. Stk.	137—140	135—140	−1
Tottenham and Edmonton, Original	11—13	11—13	—
WATER COMPANIES.			
Chelsea, Ordinary	256—261	260—265	+4
East London, Ordinary	199—202	211—215	+12½
Grand Junction	121—125	125—130	+4½
Kent	275—280	276—281	+1
Lambeth, 10 per cent. maximum	252—257	251—256	−1
Do. 7½ per cent. maximum	197—202	197—202	—
Do. 4 per cent. Debenture Stock	117—120	120—124	+3½
New River, New Shares	350—360	364—369	+11½
Do. 4 per cent. Debenture Stock	123—127	127—130	+3½
Southwark and Vauxhall, 10 per cent. max.	166—171	167—172	+1
Do. 7½ per cent. maximum	158—163	163—168	+5
West Middlesex	261—265	260—265	−½

Institution of Civil Engineers.—The seventy-second anniversary of this Institution occurred on Thursday last week, when a revised list of the members of all classes showed that the numbers now on the books amounted to 5804, representing an increase of 3·33 per cent. in the past twelve months.

The Liberty and Property Defence League, which was established about seven years ago for the purpose of maintaining freedom of contract, upholding proprietary rights, and resisting socialistic legislation, shows in the annual report lately issued by the Council (the Chairman of which is the Earl of Wemyss), a good record of work in the past twelve months. The League has, by its manifest usefulness, come to be regarded as the chief organization for opposing, independently of existing parties, undue State interference, and the socialistic tendencies prevalent in current politics. Branches of the League have been established in the most important towns of the United Kingdom, as well as in India, the colonies, the United States, France, and Italy. The lecture and publishing departments of the League were busily engaged last year; the work of the lattter being signalized by the issue of a large number of leaflets and pamphlets. The most important part of the work of the League is that which is under the supervision of the Parliamentary Committee, whose business it is to watch, and, if necessary, to oppose, all Public or Private Bills which they consider to be inimical to the rights of liberty and property. A report on the result of the Committee's labours in the past session is in preparation. The Secretary of the League, Mr. W. C. Crofts, has central offices at 7, Victoria Street, S.W.

THE POSITION OF THE BRITISH AND NORTH BRITISH WATER GAS SYNDICATES.

THE two closing months of the past year witnessed a considerable amount of restlessness on the part of holders of stock in the British and North British Water Gas Syndicates. The revelations as to the formation the Nottingham and Derby Company had disturbed the proprietors of both undertakings; and a general desire for an investigation became manifested. This will be apparent from the proceedings recorded below.

Dealing first with the British Water Gas Syndicate—the parent undertaking—our readers will probably remember that, about the middle of November last, Mr. T. Brayshaw, of Settle, sent to the shareholders a circular in which he advised the appointment of a Committee of Investigation, to inquire into the financial and general conditions of the Company. His reasons for so doing were that, notwithstanding repeated personal applications at the Company's offices, and correspondence with the Chairman (Mr. Samson Fox) and Solicitors, he had failed to obtain any information as to the position and prospects of the concern; and the Directors declined to call a meeting at which any explantions could be given. Mr. Brayshaw summed up his complaints as follows:—

> That the shares of the Syndicate, which at one time stood at £20 premium, are now at £1 10s. discount; that little or nothing has been done to bring the invention practically before the public; that the Directors have, in spite of their promise not to make any further call, made a demand for the £2 per share at present unpaid; that in making the call no explanation is vouchsafed, and none can be obtained, as to the large sums named by Mr. Fox in his speech on the 14th of May, when he stated that, in addition to the amounts received from the sub-Companies, fixed concessions had been agreed upon to the amount of £201,000 (of which £150,000 was payable in cash), and other contracts entered into to the amount of over £1,000,000, on a large proportion of which Mr. Fox stated "substantial deposits in cash have been paid to us;" that the validity of Mr. Fox's patents appears to be disputed by one of the sub-Companies; that Mr. Fox himself has shown his want of confidence in the business by parting with over 3200 of the shares held by him, only 250 now standing in his name.

On the 3rd ult. another circular was issued by Mr. Brayshaw formulating further complaints; and he also had an interview with the Directors, and laid before them his views. These circulars were replied to by the Company's Secretary (Mr. T. H. Owens), who stated, in regard to financial matters, that the Board would withdraw the payment of the second call of which they had given notice; and, as to the general position of the undertaking, they would convene an extraordinary meeting as soon as the pending action with the Nottingham and Derby Company had been disposed of. He went on to say that at the interview referred to, the Company's books were submitted to Mr. Brayshaw and his friends for inspection; and he appeared to be satisfied with the information he obtained. This being the case, the Board thought it would not be to the real interest of the shareholders to hold a meeting, and by any show of disunion to aid the action of those who were considered to have failed to carry out their agreement with the Syndicate. After the issue of this document, matters straightened themselves a little, as will be apparent from the fact that another circular, dated last Wednesday, and signed by Mr. Samson Fox and Mr. Brayshaw, was sent to the shareholders. It stated that at a conference held at the offices of the Solicitors to the Syndicate (Messrs. Kaye and Guedalla) certain terms were agreed upon by which it was hoped that all internal differences might be settled, and the concern conducted in the future with energy and success. The conclusion arrived at was that a re-constitution of the Board, by the nomination of new Directors, would be best for the shareholders, as such addition to the directorate would, by constituting a majority, carry more weight and power than any Committee of Investigation could possibly have done. All the Directors, with the exception of Mr. Samson Fox and Mr. W. Fox, had resigned, and three new ones—Mr. T. Brayshaw, Mr. T. Procter, and Mr. J. Mitchell—had been elected in their stead. The circular went on to say that it would doubtless be the policy of the new Board to instruct Messrs. Kaye and Guedalla to press on energetically the action against the Nottingham and Derby Company; and, moreover, £100,000 in cash and £75,000 in fully-paid shares had to be received from the North British Water Gas Syndicate. As to the prospects of the business, it was stated that inquiries were being made in regard to the employment of water gas in extensive works; and it was hoped that, within a comparatively short time, they would have resulted in profitable orders to the Syndicate. In fact, since the terms of the circular had been settled, two large contracts had been secured for the erection of plant for the production of water gas in two of the largest iron and steel works in Great Britain. The circular closed with an expression of a hope that the legal rights of the Syndicate would be enforced to the advantage of its shareholders, and that its affairs would be so administered as to prove to them that everything was being done solely in their interests. Such was the position of the English undertaking at the opening of the year.

Turning now to the North British Syndicate, we find that on the 4th ult. a circular was addressed to the shareholders by Messrs. Nokes and Stammers (a London firm of Solicitors acting for the holders of a large amount of stock), asking for their support to a proposal to send a requisition to the Board to convene an extraordinary general meeting to consider the position of the undertaking, in view of recent revelations with respect to the alleged patents acquired from the English Syndicate. A sufficient number of favourable replies having been received, the necessary requisition was lodged with the Secretary of the Syndicate (Mr. J. F. Copland) on the 17th ult. The result of this was the issue last Tuesday of a notice calling a meeting for Friday next, in Glasgow, to discuss a motion for the appointment of a Committee of Investigation. Accompanying the notice was a letter, signed by the Secretary, in which the Directors expressed their intention of opposing the motion, being of opinion that the proposed Committee would be inimical to the interests of the shareholders. They explained that on account of the many difficulties which had had to be combated, it had taken much longer than they anticipated to make substantial progress with the business of the Company; but during the past six weeks they had been in close treaty for two important contracts—one for the sale of eight sets of plant to one of the largest firms in the steel trade, who had decided to adopt water gas throughout their works; and the other for the experimental application of water gas to the working of iron-puddling furnaces by a large iron manufacturing company in the West of Scotland. The Directors believed that if these contracts were secured, and the practical and economical results anticipated were attained, many other applications for licenses would quickly follow. They said they had no reason to fear any attack on the validity of the patents; and they felt that it would be extremely foolish for the shareholders to pass a resolution casting doubt upon the value of their own property, especially at a time when its value was on the point of being fully established by substantial results. They had been obliged to call the meeting; but they threw upon the requisitionists the responsibility for the results. The Directors said they had nothing to conceal, and would be prepared to give all requisite information at the meeting. They felt that they had faithfully done their duty to the Company, and they asked the shareholders to support them in the course they had decided to take in this important matter. This letter called forth a reply from Messrs. Nokes and Stammers dated last Thursday. These gentlemen point out that if the actual position and prospects of the Company be as satisfactory as the Directors represent them to be, an investigation can only be productive of benefit to the shareholders, who will be informed and reassured as to their investment. They therefore express their inability to understand why the Directors should be so anxious to oppose the proposal to investigate—their action in this respect affording a strange comment on their assurance that there is "nothing to conceal." They urge the shareholders not to support the Directors' policy. This being the present attitude of the parties, the result of next Friday's meeting will be awaited with much interest.

Mr. W. J. Ware has been appointed Manager of the Maidstone Water-Works, in succession to his father, Mr. W. Ware, whose death, under rather painful circumstances, was recorded in the JOURNAL for the 3rd ult.

Brisbane Water Supply.—Plans have been adopted for improving the water supply of Brisbane. The estimated cost of the works contemplated is £500,000. The object of the improvement is to secure an adequate water supply for a population of 300,000.

The Gas Engineer's Pocket Almanac and Lighting Table for the current year, a copy of which we have received from Messrs. W. Sugg and Co., Limited, retains its utility as a useful and convenient pocket-book for gas engineers. There is no special change to notice in the contents, as compared with the issue for last year; and therefore it is sufficient to intimate here the continued publication of the book.

An Indicator of Temperature at a Distance.—M. Morin has brought out an apparatus for the purpose of indicating temperature at a distance, which may be of use in conection with the storeage of coals, &c. It consists of a thermometer with a scale about 8 inches long, reading from 0° to 30° C. The bore of the tube is about ·02 inch diameter; the bulb being constructed to hold about 7 cubic centimetres of mercury. A platinum wire, of a diameter of about 0·0008 inch runs from end to end of the tube in contact with the mercury, being connected with platinum terminals fused in the glass. The length of wire comprised between the 0° and 30° C., as marked on the scale of the thermometer, shows a resistance of 200 ohms to the passage of an electrical current. The resistance of the wire will vary considerably as the mercury rises and falls in the thermometric tube; and this is the principle upon which the operation of the instrument depends. The receiver of the apparatus consists of a low resistance Deprez-d'Arsonval galvanometer, and an auxiliary resistance working up to about 200 ohms. The current is supplied by two Leclanché cells of large size, the electromotive force of which is very constant for varying temperatures. The current is sent through the thermometer, resistance-box, and galvanometer; and the indications of the latter are controlled by the variations in the height of the mercury in the thermometer tube, which may be connected with the registering instrument by a line-wire of any length.

MR. TREWBY ON THE MANUFACTURE OF WATER GAS.

THE great attention which is now being paid by gas engineers and managers throughout the United Kingdom to the question of the manufacture of water gas, induced us to invite Mr. G. C. Trewby, the Chief Engineer of The Gaslight and Coke Company, to send for publication in these columns a communication giving an account of his recent trip to America, and the results of his investigations, on behalf of his Company, into the various water-gas processes which are in operation in that country. Owing to the pressure of business engagements, Mr. Trewby could not comply with our request, but courteously suggested that a representative of the JOURNAL should wait upon him. The suggestion was carried out a short time since, when Mr. Trewby gave a *résumé* of the information which he gathered in America. This we now present to our readers, practically in Mr. Trewby's own words.

Acting under the instructions of my Company, I recently visited the United States and the borders of Canada, and made myself acquainted with some of the principal carburetted water gas processes in use there. I found in most of the cities that carburetted water gas was more or less manufactured. In New York, about two-thirds of the supply is water gas; and at Toronto, one-half. At Chicago, on one day in September, when I was there, 7 million out of the 8¼ million cubic feet supplied were water gas. At Washington the proportion of water gas varies according to the daily consumption—ranging in the winter time from 35 to 50 per cent. I am not able to give the proportion in all the towns, because I had not time to visit all the companies or works to collect statistics; but it will perhaps be sufficient for me to state that, where petroleum spirit or crude oil is bought cheaply, the manufacture of water gas is on the increase.

The reasons which have led the different companies to supplement their coal gas supply with water gas have been, in the first place, the cheapness of petroleum; and, secondly, the desire on the part of the public to have a higher illuminating power. In some of the towns, companies have been started for the exclusive purpose of manufacturing nothing but carburetted water gas under special patents. In New York there are three distinct Companies who make nothing but this gas, besides the Consolidated Company, who make something like one-half. The illuminating power of the water gas supplied in New York is about 30 candles; and the peculiarity about this high illuminating power is that the gas burns with a clear white flame, without any appearance of smoking. It has been found to satisfy the public requirement of a high candle power, and is a successful rival of the electric light wherever introduced. In the case of some few works that I visited, where coal gas of about 16-candle power was supplied, the consumption had fallen off year by year during the last few years, and the electric light had made considerable advance. As far as I was able to judge, there does not seem to be much consumption of the gas for cooking and heating purposes; but this may be accounted for by the price ranging from 5s. to 8s. per 1000 cubic feet.

A good deal has been said about the deleterious nature of water gas, by reason of the large percentage of carbonic oxide it contains. Plain water gas contains about 40 per cent. of carbonic oxide. But in carburetted water gas the proportion is reduced to about 32 per cent.; and by specific processes even below that. The quantity in ordinary coal gas is about 6 per cent. Of course, there is no prejudicial effect produced by burning a gas containing a large percentage of carbonic oxide. The danger is that, when an escape takes place, fatal effects are likely to be produced much sooner, by breathing an atmosphere of this kind, than with an atmosphere of coal gas. Notwithstanding this, I was informed that, during the seven years water gas has been used in Chicago, not a single death could be traced to this cause. The old Boston Coal Gas Company, who opposed the introduction of water gas some years ago, induced the Legislature of Massachusetts to pass a law limiting to 10 per cent. the maximum amount of carbonic oxide to be allowed in that city; and although this would allow of an admixture of water gas equal to 16 per cent. of the whole bulk, yet it has been found impossible to make anything like this quantity and still get within the limit, because the water gas and the coal gas could not be thoroughly mixed together, and the official tester might be able to find some particular point where more than the allowed 10 per cent. of carbonic oxide existed. The present Boston Gas Company hope to have the law abrogated, especially as Massachusetts is the only State in the Union that has passed it; and, as far as I am aware, nothing of the sort exists in Canada. This being the state of the case, I think there is no fear of any legislative action that would interfere with the judicious use of carburetted water gas in this country.

Passing on to a description of the manufacture of water gas, I may shortly state that it is a very old invention; some patents in connection with it being taken out by Kirkham in 1852. The gas is produced in a vessel after the style of an iron cupola—either rectangular or circular—which is filled with anthracite coal or coke. The heat is brought up to the point of incandescence by blowing air into the cupola; and the products of combustion are allowed to pass off into the air. The next operation is the making of the water gas, which is effected by shutting off the air, and blowing superheated steam through the fuel. The steam being composed of hydrogen and oxygen, these two gases are separated. The former passes off in a free condition, and the latter combines with the carbon of the fuel, and forms carbonic oxide. These two gases, together with some carbonic acid and nitrogen, and a small percentage of sulphuretted hydrogen, form what is known as crude water gas. The effect of the steaming is, of course, to bring down the temperature of the fuel. Therefore, at the end of ten minutes, this has to be discontinued, and the mass of fuel blown up again with air; and about every two hours or oftener, fresh fuel has to be added.

There are three distinct methods of carburetting the water gas. One is known as the Tessié du Motay process. In this the gas is taken to a small gasholder which acts as a governor; thence it is led into a carburetting vessel supplied with naphtha; and from there it passes up to the fixing-retorts, which are ordinary clay gas-retorts. The water gas and naphtha go in at one end of a 20-feet retort, and out at the other end as a fixed gas; the contact with the red-hot sides making the fixing permanent. The gas then passes into the hydraulic main, and from thence through the washers, &c., in the ordinary way to the gasholders. I was told that, in the cold weather, the gas does not suffer any greater loss in illuminating power than cannel gas.

The second method of carburetting consists in the use of what is called a superheater, which is a circular or rectangular vessel, surrounded by sheet-iron and lined with fire-brick, and filled with pigeon-holed work. The operation consists in passing the hot producer gas through this vessel; admitting, if necessary, a secondary supply of atmospheric air, to effect the complete combustion of producer gas. By this means, the superheater is made red hot; and when the water gas is generated, it is passed through this vessel, and at the same time naphtha or oil is spread on the top of the producer or the bottom or top of the superheater—depending upon the course the water gas is made to take. This makes an illuminating gas of a permanent character, but not of such a constant or rich quality as by the first-named method, although the cost is apparently less. One advantage it possesses is that crude petroleum or "gas oil" can be used, which is inadmissible in the Tessié du Motay method.

The third process consists in carburetting the water gas in the cupola, without the use of a subsequent superheater. The operation consists in blowing up the cupola in the ordinary way; then, while the steaming is proceeding to make water gas, naphtha is introduced in several places round the circumference, and about two-thirds of the height of the incandescent fuel. Therefore the naphtha vapour would have to pass through one-third of the heated carbon in contact with water gas; and it is claimed that the same action takes place as with the use of a separate superheating vessel. Great care is exercised to keep the fuel at one regular height.

There is one other process which differs very much from the foregoing. It is called the Jerzmanowski; and the object of the process is the reduction of the amount of carbonic oxide made. The operation is as follows:—A fire-clay retort is set in an oven. It is filled with limestone, which is heated to redness. Steam and naphtha vapour are introduced into the mouthpiece of the retort, and passed up through the heated limestone, which decomposes some portion of the carbonic oxide formed, substituting for it carbonic acid. Another modification of the same plan is by the use of a rectangular producer divided into two parts. The first half is filled with anthracite coal or coke, and the second with limestone. The heat is blown up in the usual way; and the producer gas passes down through the limestone. When gas is being made, naphtha is passed on to the top of the limestone at the rate of 1½ to 2 gallons per minute. The effect of this method of working is to reduce the carbonic oxide from what it would be in the ordinary way—namely, 32 per cent—to not more than about 20 per cent. This gas, which has an illuminating power of about 5 candles, is conveyed to a governing gasholder, and brought back to the coal gas system of retorts to be carburetted in the same way as in the Tessié du Motay process first described. This process was originally introduced to meet the objection that has been raised to a large percentage of carbonic oxide, the reduction of which can only be effected by changing it into carbonic acid, which has no heating power, and exists as a diluent of the gas. It is claimed that the illuminating power is not appreciably lessened by leaving it in; a small extra amount of naphtha being sufficient to compensate for the deterioration in the illuminating power.

There is a process called the Meeze, which has been experimentally tried in New York, with very favourable results, for a period of fourteen months, and is now about to be tried by The Gaslight and Coke Company at one of their works. The apparatus consists of a circular retort, 18 inches in diameter, and 20 feet long, through the centre of which a cast-iron pipe, about 6 inches in diameter, is led from one end to the other. The oil to be used, and superheated steam, are passed through this pipe to the extreme end of the retort, and find their way back between the pipe and the sides of the retort in contact with conical deflectors; and in this way a certain quantity of steam is taken up in combination with the oil, and made into a very rich gas. The water gas, manufactured in the ordinary way and already stored in a holder, is brought into contact with this gas, either in the retort or in the hydraulic main; the result being

that a gas of about 27-candle power is said to be produced. This process was brought out for the purpose of dealing with the heavy oils and petroleums, and is thought to be thoroughly suited for the Russian petroleum, which is very heavy, and contains but little naphtha. If anything is to be done in introducing water gas into this country to any large extent, it will probably be by means of the importation of Russian petroleum, which, as far as I can see, is likely to be delivered here at a cheaper rate than American oil, unless it be the Lima oil, which is found in the State of Ohio. This oil, however, contains a large quantity of sulphur. It must be understood that, in the manufacture of water gas, no alteration is required in the existing plant of a gas-works. The only addition would be a cupola, and the necessary blowing apparatus for getting the fuel up to a state of incandescence.

I cannot close my account of the various processes I inspected without mentioning the cordial way in which I was received by the different gentlemen connected with the gas industry in America and Canada with whom I came in contact, and to whom I am greatly indebted for the amount of useful information I have collected.

Oil v. Electricity for Train Lighting.—According to the *Railroad Gazette* of New York, the Boston and Albany Railway Company have abandoned their experiment in electric train lighting. The trial was carried out on two full trains, and was continued for two years and a half. Although instructive and valuable as an experiment, the great expense was against the adoption of the system. The trains which were electrically lighted are now, we believe, to be fitted on the Pintsch gas lighting system, which is already in use in Wagner cars running to Boston over the Boston and Albany Company's line.

The Supply of Natural Gas at Pittsburgh.—Rumours have for some time been prevalent that the supply of natural gas at Pittsburg is rapidly diminishing. The alarm to which these reports gave rise has been to a certain extent mitigated by the publication of the results of an inquiry set on foot by one of the local papers. They may be summarized thus: The developed resources of the gas-fields are rapidly diminishing as the drafts upon them increase and accumulate. By the laying of large pipes, adopting low pressure, and the enforcement of reasonable economy in the use of gas, the life of the fields can be materially prolonged. The extension of old fields gives much promise. Not the slightest alarm need be felt that the supply will fall short of what is needed for two or three years more; and within that time it is thought the discovery of new fields, the unexpected extension of old fields, and the greater experience gained in producing, carrying, and using the gas, may be such as to make the supply last much longer.

Gas Undertakings in South Australia.—According to some extracts from Adelaide newspapers which have been forwarded to us by a correspondent, the gas undertakings in South Australia are threatened with the competition of local authorities in a manner which will be quite unprecedented. It appears that last October a Bill was introduced into the Legislative Council, to authorize Corporations and District Councils to supply gas and electricity for lighting and other purposes. The proposition naturally aroused the Directors of the South Australian Gas Company, who very promptly presented a petition against the measure. They pointed out that, during the 28 years in which they had carried on business, they had expended upwards of £250,000 in the purchase of land and the erection of plant for lighting various districts throughout the Colony, and that a large sum of money had been invested in the undertaking on the faith of Acts of Parliament conferring upon the Company certain privileges. They referred to the reasonableness of their charges, and the moderate rate of interest with which the proprietors had hitherto been contented; and while they did not ask Parliament to withhold from other people similar powers to those which had been granted to the Company, they pointed out that Parliament had always restrained corporations and similar bodies from expending public funds in competing with existing companies in the supply of gas and water. They cited the various enactments bearing on this point, and suggested that if it was deemed beneficial to pass the Bill, in order that municipal authorities should be enabled to supply light, a clause should be inserted to the effect that the existing undertakings must first be acquired at a price equal to 18 years' purchase of the net profits estimated over a period of three years preceding the proposal. Although there does not seem to be anything outrageous in such a proposition as this, it was adversely criticized by a local paper, which contended that the proposals to purchase should be untrammelled by any such condition as that suggested. The arguments brought forward by the writer were, however, fully exposed by a correspondent in a succeeding issue, who pointed out that the Company were not asking for anything more than had been allowed in Melbourne, and that what was considered to be right and proper there could scarcely be regarded as a mistake in Adelaide. As far as can be judged by the information before us, there is no necessity for passing such a Bill as the one proposed; and the colonists will doubtless refuse to allow public money to be expended in the way suggested therein, even on the plea brought forward, that such legislation will be only extending the principle of "the greatest good to the greatest number."

COMMUNICATED ARTICLE.

THE CHEMISTRY OF ILLUMINATING GAS.*

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXVI.

A paper on the subject of producing gas from oil was contributed to the 1887 meeting of The Gas Institute by Dr. Stevenson Macadam,† who stated that, after making experiments with various temperatures of distillation, he found that, according to the quality of the paraffin oil employed, there was more or less tendency at low heats to distil oil instead of permanent gas. At high heats there was a liability to decarbonize the oil and gas, and to obtain a thin gas of comparatively low quality. But a good cherry red, regularly maintained, gave a large proportion of high-quality permanent gas, with but little tarry matter and separated soot. After trying various methods, such as vaporizing the oil before admitting it to the retort, or filling the retort with coke, he arrived at the conclusion that the best results were obtained by the more simple arrangement of employing iron retorts at a good cherry-red heat, and running in the oil as a thin stream directly into an empty retort. In addition to the oils previously mentioned, he had used an intermediate oil, which came between the burning and the lubricating oils. These trials had been made, not only in the small oil-gas works fitted up in connection with his laboratories, but on the larger scale required for lighthouse service. Some of the best practical trials were made with Pintsch's and with Keith's apparatus. The first named comprised a bench of four retorts, each 4½ feet long by 7 inches in diameter, connected as double retorts. The oil, dropping into the upper retort, travelled as vapour and gas the whole length, and then through the lower retort; being thus exposed to about 9 feet length of heated surface. At another and larger works, retorts 10 inches in diameter and 6 feet in length were used. The gas was conducted through a hydraulic main, a foul main, condensers, washers with water, and purifiers with lime and sawdust, to the holder. The Keith apparatus comprised a bench of two retorts, each 5½ feet long, and set separately. The oil ran in at one end, and the gas escaped at the other; so there was only 5½ feet length of heated surface. The results obtained are given in the following table:—

Blue Paraffin Oil.

—	Pintsch's Apparatus.			Keith's Apparatus.		
	A.	B.	Average.	A.	B.	Average.
Specific gravity of oil	877·6	878·2	877·9	874·1	877·6	875·9
Flashing point	296°	294°	295°	292°	286°	289°
Firing point	356°	352°	354°	348°	346°	347°
Gas per gallon, cubic feet	90·7	103·4	97	85	84·8	84·9
Gas per ton, cubic feet	23,128	26,356	24,742	21,772	21,671	21,721
Illuminating power	62·5	59·1	60·8	63·2	59·5	61·4
Volume of oil flowing into each retort per hour	1·4	1·18	1·29	2·3	1·3	1·8
Gas per retort per hour	126·8	122·5	124·6	197·5	111·9	154·7
Heavy hydrocarbons per cent.	39·2	37·1	38·2	39·9	38·2	39·0

There was a small quantity of carbonic acid, in no case exceeding 0·3 per cent.; and the gas from the Keith apparatus showed a decided trace of sulphuretted hydrogen. The better results obtained in the B trial with the Pintsch apparatus are attributed to greater care to secure uniformity of heat, and to a slower supply of oil. At the close of this test, the retorts were found to be in good heat and moderately clean. The Keith apparatus was also carefully fired. There was, however, a difficulty in keeping the retorts up to a proper heat; and at the close they were found to be reduced in temperature below the degree that is desirable for the thorough breaking up of the oil into permanent gas, especially at the part where the oil fell in, which was almost black. It was also apparent that the length of heating surface was not sufficient, as semi-decomposed oily matter was deposited in the condenser, and there was much tarry matter left in the retorts. In all cases the gases were thoroughly permanent. Better results might be obtained by returning the tarry oils from the condensers into the retorts. The high quality of the gas rendered it unsuitable for ordinary use, although it could be consumed with small burners—not exceeding No. 1. If it was to be diluted to ordinary qualities, Dr. Macadam considered water gas was the best diluent. Two volumes of water gas to one of oil gas would give a 20-candle gas; equal volumes, a 30-candle gas. So that 300 cubic feet of 20-candle gas could be obtained from a gallon of oil.

A discussion followed the paper, in which Mr. C. Gandon said that he had made a number of experiments on the production of gas from oil, with the view of enriching very poor wood gas, and the quality could easily be raised by this means from 6 or 8 to 16 or 18 candles. He had tried various plans, such as distilling the oil by itself, or letting it trickle in after the charge of wood had been practically worked off; but he was much

* Continued from previous volume (p. 1202).

† See JOURNAL, Vol. L., p. 110.

troubled with deposits of carbon, almost like soot, in the mouthpieces and ascension-pipes. Mr. Hunt understood that the most suitable oil was the "intermediate"—one of the products from the distillation of shale; and he said he would like to know if the supply of it was sufficient to meet a largely increased demand, such as would be brought about by its use for gas making. It was probable that a large demand, operating on a limited supply, would cause a substantial advance in price. Mr. Beilby said he had submitted some samples of gases from shale-oil stills to Professor W. Foster, who stated that the specimens taken at the commencement of the distillation contained from 20·6 to 14·5 per cent. of hydrocarbons; while some samples taken later on contained 13·06 to 12·12 per cent. Carbonic oxide, carbonic acid, and free oxygen were practically absent from several of the samples. A few tests of the carbon density in the heavy hydrocarbons showed that they ranged from 3 to 3·9. Gases belonging to the paraffin series made up the bulk of each sample; and free hydrogen, if present at all, could only be so in a very small proportion. The gases remaining after absorption of the heavy hydrocarbons, though largely represented by methane, also comprised a considerable proportion of the higher members of the series. Experiments on a sample containing 14·5 per cent. of heavy hydrocarbons showed that the remainder might consist of 39 per cent. of methane and 26·5 per cent. of ethane. Mr. Beilby said he might mention that the gases were formed incidentally in the redistillation of the oil; about 1½ cubic feet per gallon of oil being obtained. The illuminating value was 36 candles; and they were quite permanent in respect to cold and pressure. Mr. Aitken said that, according to Dr. Macadam's figures, it would not be a profitable operation to manufacture gas from oil in comparison with coal. The supply of the oils, with the exception of ordinary crude paraffin oil, was so limited that the market would immediately rise in the event of any large demand taking place.

Dr. Macadam thought that the deposit mentioned by Mr. Gandon might be due to steam evolved from the wood; as, when working with steam in conjunction with the oil, he had found that favourable results could not be obtained. In order to get a ton of oil, 8 tons of shale had to be heated; and so he thought it was better to extract the oil, which was really the gas-yielding substance, than to transport to the gas-works a material of which seven-eighths was absolutely worthless. He did not think that a large demand would necessarily raise the price of paraffin to any extent. He read a communication from Professor W. Ivison Macadam, which stated that the experiments already referred to were made with an apparatus equal to distilling 20 gallons of oil per day. In a works capable of producing from 4000 to 4500 cubic feet of gas per diem when running continuously, although the workmen were not yet experienced in the manufacture of oil gas, no difficulty was found in getting 85 cubic feet of 60-candle gas per gallon of oil used, containing 36 per cent. of hydrocarbons absorbable by bromine. The President (Mr. W. Foulis) said he had made a number of experiments on various kinds of oils, using an ordinary clay retort, and found no difficulty in getting good permanent gas of 40 to 60 candle power. Oil at 3d. per gallon, capable of yielding 80 to 90 cubic feet per gallon of such gas, would compete favourably with cannel in many localities.

For further information as to the waste gases from oil-stills, referred to by Mr. Beilby, a paper read by that gentleman in conjunction with Mr. M'Arthur, before the Glasgow Section of the Society of Chemical Industry, may be consulted.* These gentlemen point out that the later stages in the redistillation of crude shale oil and petroleum are invariably attended with the production of permanent gas. The crude shale oil, which contains naphtha, burning oil, intermediate oil, lubricating oil, solid paraffins, basic and acid tars, &c., is distilled to dryness in a moderate current of steam. Sometimes it is first treated with weak sulphuric acid and caustic soda, for the removal of a portion of the tars. This is more or less intentionally a destructive distillation, resulting in the production of an oil of lower specific gravity, containing a smaller quantity of tars, and therefore more easily refined. Every care is taken to regulate the process, so as to decompose the basic and acid impurities; and at the same time allow the paraffins and olefines to escape intact. A residue of pitchy coke remains in the still; and the hydrocarbon gases, sulphuretted hydrogen, ammonia, and water vapour pass away from the condenser.

A litre of the crude oil distilled to dryness in a glass flask (a current of low-pressure steam being passed through the oil during distillation) gave a residue of 1·2 per cent. by weight in the flask, 97½ per cent. of oil, 0·9 per cent. of gas, and 0·4 per cent. loss. The volume of the gas was at the rate of 1·1 cubic feet per gallon of oil; and its illuminating value was 35 candles. On the practical scale, a still charged with 2425 gallons of crude oil gave 2800 cubic feet of gas, or 1·15 cubic feet per gallon of oil, having a quality of 34 candles. A still charged with 2400 gallons of the oil obtained by the first distillation gave 4000 cubic feet of 29-candle gas, or 1·66 cubic feet per gallon. It was observed that as soon as the distillate reached a specific gravity of ·890, the gases commenced to come off freely. From this stage until the yellow [resinous end of the distillate made its appearance, the illuminating power was from 40 to 45 candles. During the running of the resinous distillate while the still was working, the quality was 24 candles. After standing for 36 hours, some of the 34-candle gas was scrubbed with heavy oil. The result was the extraction of 1·2 gallons of naphtha per 1000 cubic feet of gas, and a reduction of the illuminating power to 22 candles. Since regulated decomposition was one of the chief objects of the first distillation, the production of a certain quantity of gas was unavoidable; although the extent of decomposition, and consequently of the yield of gas, had been diminished by the system of long feeding recently introduced. The steam was applied with that object; and without it the production of gas would be larger.

It appears that the quantity of gas produced is very small in proportion to the quantity of oil treated; that it begins to make its appearance when a certain temperature is reached in the still, and, of course, continues till the close of the operation. The fact that it comprises less than 1 per cent. of the quantity of oil treated, robs the process of any interest so far as the practical production of gas is concerned; and its formation may perhaps be ascribed to the fact that the accumulation of solid matter at the bottom of the still causes that part to become heated to a degree considerably above that of the bulk of the contents. The fact that a larger yield of gas is obtained from the second than from the first distillation, disposes of the theory that the gases may have a pre-existence, and be dissolved or held in suspension by the oil.

* See JOURNAL, Vol. XLIX., p. 397.

Companies Wound up during the Past Year.—Among the joint-stock companies against which winding-up orders were granted during the past year were the following:—Atkins Filter and Engineering Company, City of Dunedin Suburban Gas Company, Defries Safety Lamp and Oil Company, Mablethorpe Gas Company, National Pure Water Engineering Company, Paignton Water Company, and the Ridsdale Railway Lamp and Lighting Company. Voluntary liquidations were ordered to be proceeded with, under the supervision of the Court, in the cases of the Beck Gas-Engine Company, the Fourness Regenerative Lamp Company, and the Nottingham and Derby Water Gas Company.

A Profit-Sharing Scheme at Nottingham.—On Monday last week, Messrs. Lee and Hunt, of the Arkwright Tool-Works, Nottingham, gave their annual dinner to their workmen. About 60 took part in the gathering, which, apart from the enjoyment associated with it, was rendered specially interesting by the announcement on the part of the firm of their intention to make an attempt to conciliate capital and labour by introducing a scheme of co-operative production and profit-sharing. After paying working expenses, the firm expect 5 per cent. out of the net profits as interest on capital, and propose to apportion any balance as follows:—10 per cent. as a mutual reserve fund against bad years; half the remainder to the firm; and the other half to the workmen, in proportion to the wages earned by them. The announcement was received with applause.

Reservoir Inspection in America.—A Committee to propose more efficient legislation in the State for inspecting dams and reservoirs has been appointed by the Connecticut Association of Civil Engineers and Surveyors. The supervision of dams is now under the Board of Civil Engineers. The Chairmain appoints a Deputy Inspector for each congressional district. Before a dam is built, the plans have to be approved by a member of the Board; and the law requires three inspections during construction. But there is no provision for reinspection; and the law does not provide penalties to make even the building inspection efficient. The *Engineering and Building Record* says the State has a large number of dams, some of which it is believed are now unsafe even if they were adequate when built; and the idea is to have a regular system of inspecting established, with power to compel repairing.

The Action against Mr. Ellis Lever.—In a "stop press" edition last Friday evening, the *Salford Reporter* stated that information reached them "to the effect that Mr. Ellis Lever (against whom the Salford Corporation have taken action in the Court of Chancery for the recovery of a large sum of money in respect of commissions paid and promised to Hunter), accompanied by his Solicitor, Mr. Rhodes, of Halifax and London, had paid a visit to the convict in Strangeways Prison, Manchester, with reference to these proceedings. Mr. Rhodes, it may be said, is the gentleman through whom Hayward made his offer to the Corporation of £5000 for the right to recover from the contractors, moneys alleged to have been paid in bribes. The interview, which lasted over two hours, was obtained by Mr. Lever through the Home Office. Mr. Lever, we understand, expressed his willingness to assist Hunter in his endeavour to obtain his release. The period allowed to the defendant in the civil proceedings in which to file an answer to the interrogatories, expired on Friday last [the 27th ult.]; but we believe Mr. Lever has not yet filed any answer, and the authorities are credited with the intention to apply for an order of commitment." In Chambers, last Thursday, Mr. Chas. Gould, on behalf of the Salford Corporation, applied to Master Wilberforce for a peremptory order on Mr. Lever to file within four days his answers to interrogatories in the proceedings which have been taken against him in the Chancery Court. Mr. Lever's Counsel said his client had met with a serious accident, and had consequently been unable to instruct his Solicitor. He desired an extension of time in which to answer the interrogatories; and the Master allowed him 21 days.

TECHNICAL RECORD.

GAS v. ELECTRIC LIGHTING FOR RAILWAY STATIONS.

A recent number of *Engineering* contained an abstract of an interesting paper contributed by MM. Sartiaux and Weissenbruch to the last Railway Congress, giving an account of the general experience in the electric lighting of railway stations. The authors collected a large amount of valuable information as to the cost of this system as compared with gas, from which we extract a few particulars.

It is in uncovered stations that electricity finds the most favourable field as an illuminant. There is no difficulty in placing the lamps at the requisite height; while the standard of illumination desired is just that which arc lighting is best adapted to meet. The only other appliances which enter this field as competitors are the Lucigen lamp and similar apparatus. These, however, do not appear to have been very successful on the Continent. One of the great difficulties has been to draw a fair comparison between the amount of light rendered by different systems of lighting; and hence there has been great diversity of practice and opinion. On the Northern Railway of France, lights of 12 and 25 ampères, under an electro-motive force of 45 volts, give a satisfactory light in open spaces over a spherical surface of 85 to 100 metres when placed at a height of 9 to 10 metres. For covered spaces and passenger platforms, lamps of 6 ampères, at a height of 4½ metres, and placed from 20 to 30 metres apart, give good results. At the Paris terminus of the Western of France Railway (St. Lazare), the lighting is effected by 2 arc lamps of 2000 candles, 138 lamps of 400 candles, and 16 lamps of 250 candles (all horizontal intensities); in addition to which there are 113 incandescent lamps of 10 to 16 candle power. The machinery is so arranged that it will allow the disposition of the lamps to be varied to 175 arcs of 400 candles, 15 arcs of 250 candles, and 125 incandescent lamps. The installation is to be maintained by the contractor for ten years, except that the cleaning of the lamps, the replacing of the carbons, and the lighting and extinction are done by the Company's servants. At the end of the term the whole installation will become the property of the Company without further payment. The Company can, however, take over the installation at any time by paying its actual cost, which has been fixed at £20,000, less 10 per cent. for each year for which it has been in operation. The payments are as follows:—4d. per hour per lamp of 400 candles; 3d. per hour per lamp of 250 candles; 0·5d. per hour per incandescent lamp of 16 candles; and 0·35d. per hour per incandescent lamp of 10 candles. The two latter charges are equal to about 10d. per Board of Trade unit. It was set forth that the intensity of the lights should be measured as follows:—The standard for the incandescent lamps should be "star" candles of five to the pound. The 400-candle arc lamps were to have a luminous intensity at least three times that of the Paris Gas Company's burner consuming 1200 litres (41·4 cubic feet) of gas per hour. The 250-candle lamps were to have a power double that of the gas-burner. The intensities were to be measured horizontally, with the lamps enclosed in globes; and the carbons were to last for six hours.

The cost of electric lighting is steadily declining, particularly in those items, such as interest and amortization, which vary with the first cost of the installation. Even in the matter of maintenance the expense seems to be decreasing; as is shown by a comparison of two years' working expenses of a 40-light Brush installation at the Waverley Station (Edinburgh) of the North British Railway. With 33 lamps at work for 41,884 hours between July and December, 1884, the total cost was £484 6s. 6d., or at the rate of 2·77d. per lamp-hour. In the corresponding six months of 1886, the cost of the same number of lamps running 56,174 hours was £411 0s. 9d., or at the rate of 1·75d. per lamp-hour. The cost of carbons and of the renewal of incandescent lamps is always a heavy item. At the Bebra Station of the Prussian State Railway, it is reckoned at nearly half the total working charges, including amortization; at the Western Station in Vienna, it is 39 per cent.; at Feldkirch, 33 per cent.; at Venlo, 25 per cent.; on the Northern Railway of France, 13 to 24 per cent.; at the Northern Station, Brussels, 10·5 per cent.

In spite, however, of the gradual reduction of the cost of electric lighting, and of the high price of gas abroad, a very considerable increase of outlay is required for the new illuminant. The Paris, Lyons, and Mediterranean Company report that the lighting of their Paris terminus, formerly accomplished by 184 gas-burners at an annual expense of £1000, now costs £2400 with the electric light. At Marseilles, where gas is sold at 3s. 4d. per 1000 cubic feet, 441 burners cost annually £1200, until they were replaced by electric light at £2820. At certain stations where water power is available, a slight economy has been effected. In all cases, however, there is a greatly increased amount of light. For instance, it is calculated that had the St. Lazare Station in Paris been lighted with gas, the cost would have been only two-fifths of what it is; but the light would only have been one-fifth. At Bebra the substitution of electricity for gas has doubled the cost, while the illumination has been increased thirty-fold.

The authors made a calculation of the respective values of gas and electricity when used as lighting agents in various ways. According to this, the incandescent lamp of 16-candle power consuming 50 watts is the equivalent of a gas-burner using 5·3 cubic feet, and giving 16-candle light. In these conditions, 1000 cubic feet of gas equal 8490 watts. As lamps were divided into different categories, according to their power, and were compared with equivalent gaslights. A Wenham lamp, consuming 255 cubic feet of gas, they found to have a mean spherical intensity of 171 candles, and was equivalent to an electric lamp of the same power using 157 watts; 1000 cubic feet of gas being thus equivalent to 6170 watts. In the Paris Exhibition there were some large burners consuming 430 litres (157 cubic feet) of gas per hour. These probably had a mean intensity of 9 candles per cubic foot, or 1400 candles in all. A continuous current arc lamp of this mean intensity would produce a greater illumination on the ground, and would not require more than 750 watts (0·535 watt per candle). Under these conditions, 1000 cubic feet of gas is equivalent to 4700 watts. Further, if we endeavour to ascertain the equivalent of electric lights of 1050 candles (550 watts), and of gas-burners of 11 candles of horizontal intensity, consuming 32 cubic feet, it follows that it needs, at least, 110÷12 = 9·2 gas lights for one electric light. In reality, the electric lights send a ray, at 15° below the horizontal, which has 1570-candle power; and at 40°, a ray of 3120 candles. Each of them will produce a better illumination than twelve small lamps, having a total intensity of 1050 candles. Using the preceding figures as a basis of computation, it is easy to deduce a comparative estimate of the cost of gas and electric lighting under any particular circumstances. The price per watt varies with the number of hours of lighting, as is shown by the following figures supplied by the Northern Railway Company of France. At their Calais station, the number of hours lighting per lamp per annum is 500; the number of lamps of 25 ampères and 45 volts in use, 8; and the price per 1000 watts (including interest and sinking fund, 9·4 per cent. per annum), 10·42d. The figures for other stations are as follows:—La Chapelle: Hours of lighting, 1010; number of lamps, 8; price per 1000 watts, 16·3d. La Chapelle sorting station: Hours, 3582; lamps, 8; price, 5d. Lens: Hours, 3333; lamps, 7; price, 5·3d. St. Martin: Hours, 3729; lamps, 6; price, 4·7d. Condekerque: Hours, 3741; lamps, 4; price, 6·9d. Longueau: Hours, 3924; lamps, 5; price, 5·4d. Hirsin: Hours, 4288; lamps, 6; price, 1·46d. The authors' calculations, which were embodied in tables and diagrams, show that the cost of incandescent lighting does not fall below that of gas at 4s. 1d. per 1000 cubic feet until the lighting is prolonged beyond 3250 hours. On the other hand, with arc lighting in large stations, electricity is cheaper, for a given illuminating power, than gas at 1s. 7d. per 1000 cubic feet when the period of lighting exceeds 2000 hours, and is equal to gas at 1s. 1½d. for 3000 hours.

Combined Electric Light and Gas Undertakings.—That gas and electricity can get on very well together has lately been demonstrated in several towns on the Continent, but probably nowhere in a more striking manner than at Stockholm. There the Gas Company have applied for funds for the erection of a large central electric light station, and at the same time for the erection of new gas-works. The money required is about £80,000 for the former, and £275,000 for the latter undertaking. The consumption of gas has lately risen considerably in the city, notwithstanding the employment of electric lighting. In Gothenburg, in spite of a number of new electric installations, the consumption of gas rose from 2·5 million cubic metres in 1887 to 2·7 millions during 1888—an increase of 8 per cent.

The Wenham System of regenerative ventilating lighting has been adopted in the Nottingham Free Library, which was re-opened last Wednesday after being closed about eighteen months. The reading-room is lighted by fourteen No. 3 lamps, specially designed for the purpose; the casing being of delicately tinted Doulton ware, with polished brass mountings. The decorations are thus of a permanent character. The reference library is lighted in a temporary manner, in accordance with the wishes of the Estates Committee of the Corporation, who were desirous, before adopting the new system permanently, of being assured of its success in the reading-room. Several Wenham lamps have, however, been suspended from the ceiling. Mr. W. R. Chester, the Gas Engineer to the Corporation, was entrusted with the lighting; and in deciding on the Wenham system he adopted a plan which is already working successfully in the new wing of the Borough Asylum. The lamps in the reading-room are connected with four ventilating shafts, whereby the heat and products of combustion will be entirely removed. These shafts are of galvanized iron tubing, packed in slag-wool, and enclosed in another shaft covered with slate slabs, over which are laid the boards of the reference library floor above. This is a great improvement upon the system previously in use, under which the ventilating flues over the lamps were so badly protected that the beams of the building were actually charred by the heat. The Mayor (Mr. Alderman Goldschmidt), who performed the opening ceremony, stated that the general plan of the lighting was, in a measure, due to Mr. Alderman Barber, whose ideas had been ably carried out by Mr. Chester. While on the subject of the Wenham system of lighting, it may be mentioned that it is in use at Drury Lane, Covent Garden, and Her Majesty's Theatres this season.

REGISTER OF PATENTS.

Treating Gases and Recovering Sulphur.—Barrow, J., of Clayton, near Manchester. No. 17,528; Dec. 1, 1888. [8d.]

The patentee claims that he has discovered that sulphuretted hydrogen as produced, say, in the manufacture of gas by the distillation of coal) can be rendered practically inoffensive and sulphur be recovered in an almost pure condition by causing it to pass, either alone or mixed with other gases, or to come into contact in any convenient manner with a solution of perchloride of iron or perchloride of manganese; and this treatment is continued until precipitation of sulphur has ceased. The chloride of manganese and the chloride of iron, after reduction from the condition of perchlorides by sulphuretted hydrogen, are very easily changed to the condition of perchloride in readiness for re-use by bringing the chloride in solution into contact with the higher oxides of iron or manganese; and by this treatment they may be re-used an indefinite number of times. The solution reduced (completely or partially) from the state of perchloride, is left to deposit sulphur, or it may have the sulphur filtered from it; and when the sulphur is removed, the liquors are caused to pass through beds of the higher oxides of iron or manganese, to restore them to their previous condition of perchlorides for re-use as indicated. The gases associated with the sulphuretted hydrogen—carbonic acid, ammonia, and bisulphide of carbon—may be utilized after separation of the sulphuretted hydrogen from them, instead of being wasted as they at present are in some manufacturing operations. In particular carbonic acid gas arising during the manufacture of sulphate of ammonia may, after the separation of the sulphuretted hydrogen by the use of the perchlorides as above described, be applied to the purpose of liberating further quantities of sulphuretted hydrogen from the sulphides of the alkalies or sulphides of the alkaline earths.

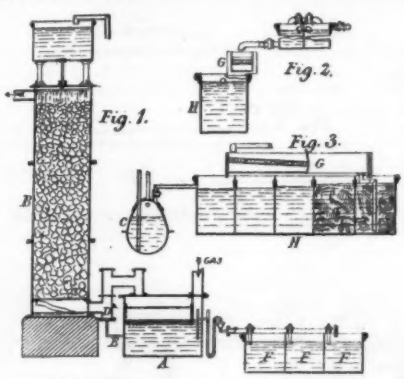


Fig. 1 is a vertical section. Fig. 2 is a vertical section through the settlers, filter, and revivifiers. Fig. 3 is a longitudinal vertical section through the revivifiers, a vessel for containing a solution of perchloride, and a filter (part of the latter being shown in elevation).

A is a washer and B a scrubber as commonly used in gas-works. F is a settling-tank, divided as shown. There is a pipe by which solution can pass from the washer; and this is provided with a number of branch-pipes, each arranged to communicate with one of the settlers, and provided with a valve for controlling the communication. Each of the settlers is furnished with an outlet-pipe, with a valve by which it can be placed in communication with one of two pipes connected to the outlet. The settlers are also in communication with each other by holes in the walls between adjacent settling chambers. By this construction, liquor can be caused to pass through the successive chambers as well as from the last chamber back to the first in the series. Thus there may be one or more of the settlers working in succession as desired. G is a filter arranged below the outlet-pipes of the settling-tanks, and above a revivifier H. C is a vessel for containing solution of a perchloride. This vessel communicates with the revivifiers, and with a feeding-tank above the scrubber. The gas to be treated passes through the washer and scrubber in the usual way, meeting or being brought into contact in its passage with the solution of perchloride of iron or of manganese flowing through these vessels; and in this way effecting the decomposition of the sulphuretted hydrogen present in the gas. The washer and scrubber shown are, however, supplemental to the usual washers and scrubbers for removing all tar and ammonia from the gas. The course followed by other gases charged with sulphuretted hydrogen will be the same—namely, through a washer and a scrubber, the arrangement of which can be varied to suit the requirements of various manufactories.

The course followed by the solution, and the manner of treating it, may be thus described: The solution of the perchloride in the vessel C is forced to the top of the scrubber, through which it is then caused to descend and fall into the washer through the pipes D and E after becoming charged with sulphur. The resulting solution of proto-chlorides of iron or manganese, or both, mixed with some perchloride of iron and with sulphur, is caused to pass through the system of settlers for the further purpose of allowing the sulphur to deposit. When found necessary by the accumulation of sulphur, the liquid contents of the settling-tanks are run off successively on to the filter-bed G, when the sulphur will be left drained, ready for removal and drying by any of the now well-known means; or it may be fused and crystallized. The liquors which pass through the filter-bed G flow into the revivifier H, which comprises a vessel with a series of compartments, the first two or more of which are charged with burnt oxide or the higher oxides of iron, or with one of the higher oxides of manganese, which revivify or reconvert the proto-chloride of iron or manganese into perchloride of iron or manganese, thereby making it suitable for again reducing sulphuretted hydrogen. This operation may be assisted by heated air, or by a mixture of steam and heated air, for which purpose air may be forced through pipes heated by a furnace, and; then through the oxides in the revivifier. The other compartments of the vessel H are used as settlers for any oxide that may be washed over with the regenerated perchloride; and the perchloride then flows into the vessel C, and thus completes the cycle of operations.

Manufacture of Gas.—Jones, F. J., of Leek, and Alexander, L. C., of Putney. No. 17,613; Dec. 3, 1888. [8d.]

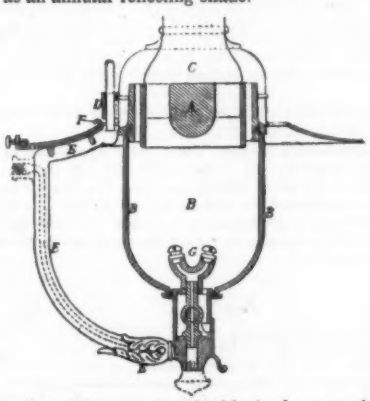
This invention relates to the production of illuminating and heating gases from coal, shale, cannel, and other like materials, by a process similar in principle to that described in patent No. 15,728 of 1886.

The process consists essentially in effecting the distillation of the coal at a comparatively low temperature (so that the benzole and other hydrocarbons which are very rich in illuminating power may not be decomposed) by causing the gaseous products of combustion from a furnace to pass through a stratum of coal, so that the products will be mixed with the gas and tarry vapours and other hydrocarbons which distil off; and in then superheating this mixture of gases and vapours, whereby the volatile constituents of the tarry vapours and other hydrocarbons are converted into a permanent gas, while the excess of carbon is deposited. The gas, instead of being generated under the pressure necessary to force it through the hydraulic main, and being allowed to cool down immediately after leaving the retort, as in the ordinary retort system, passes freely or under exhaustion from the distilling chamber (no hydraulic main being used); and is then immediately superheated—the gas passing from the superheater directly to the purifiers (unless it is required to be cooled down, which may advantageously be done by passing the gas through a regenerator), after which it is ready for use.

By this process it is claimed that a much larger yield of gas may be obtained from a given quantity of coal, as the products of combustion augment the volume of the gases and vapours, and carry them into the superheater, where the volatile constituents of the hydrocarbons are converted into rich permanent gas, which brings up the quality of the whole volume of the gas to the required standard.

Gas-Lamp and Igniting Device.—Barkowski, R., of Hammersmith. No. 273; Jan. 7, 1889. [8d.]

This invention refers to a regenerative gas-lamp, comprising: A burner, with an igniting device supporting a glass combustion chamber; a regenerative block, having air inlets and outlets resting upon the chamber; a chimney and air-inlet casing above the block, and pivotally arranged therewith; and a single arm adapted to carry the parts as well as an annular reflecting shade.



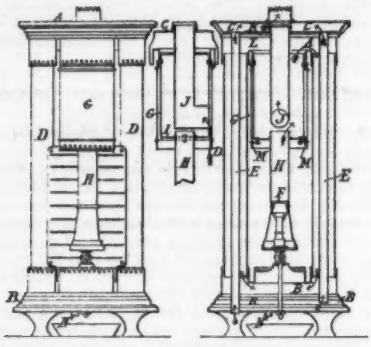
In the illustration, A is a regenerative block of non-combustible, non-metallic substance, in one or more pieces, with air inlets and outlets from the combustion chamber B to the chimney C. The lower part of the centre of the block is rounded on the lower side, as shown. The heat absorbed by this and the whole of the centre portion of the block is transmitted through the radiating ribs to the thin annular shell, to assist in warming the incoming air passing down into the chamber B. The block is formed on the under side to receive the upper part of the glass combustion chamber B, and to support the chimney on the upper side; the latter resting on an annular ring. It is fitted within a metal ring or frame, to which a socket or strap D is secured. A casing surrounds the base of the chimney, which extends downward to the metal ring or frame, and is perforated to admit air to the inlets and thence to the combustion chamber. A bent or curved arm E terminates above in a vertical pin, which fits into the socket D, upon which the whole of the upper part of the lamp may swivel. The pin is made longer than the depth of the socket, and has a shoulder at its junction with the arm E, so that the upper part of the lamp may be lifted clear of the glass and swung upon one side; the socket D resting upon the shoulder, or upon a projection higher up, and thus allowing the glass to be removed, or the cleaning of it in place. The arm E is curved inwardly at the top; and to it a holder F is secured, which receives an annular shade or reflector kept in place by a screw.

The lighting device extends upward from the lower end of the arm E to the burner; and it also serves to support the glass combustion chamber B. The burner G is so arranged with a small hole in the shell of its tap plug as to permit gas to enter the chamber formed by the casing at the same time that gas is turned on at the burner. When a light is applied the gas within is fired, and passing through the holes in the ring at the top of the casing, ignites the gas at the burner.

Gas-Stoves.—Dick, W. B., of Putney. No. 710; Jan. 15, 1889. [6d.]

This invention relates to condensation heating stoves; the construction being shown in the engraving (next page) in elevation and vertical section, as well as a detail on an enlarged scale.

The stove consists of two hollow casings; the top casing A being divided into upper and lower compartments K, L, by a horizontal mid-rib or removeable plate C. The lower casing B and the under compartment of the top casing are connected together by two tubes D,



within which are other tubes E. These tubes may pass through the under casing so as to communicate with the atmosphere at their lower ends, as seen at the left-hand side of the engraving, or they may be terminated within the lower casing as seen at the right-hand side—their higher ends in either case communicating with the upper compartment of the top casing. The gas-burner F is supported on the lower casing B; and above it there depends from the upper casing a tube G, which is double cased, having an annular space M for the passage of air between the casings. The funnel H of the burner enters into the lower end of the tube, which end is otherwise closed by a diaphragm or plate I. The interior casing of the tube communicates with the lower compartment of the upper casing, and through the side tubes D with the lower casing B, in which the gaseous products of combustion are condensed, and from whence they pass out through a hole or tap N.

With the arrangement shown at the left-hand, the gaseous products in their passage to the lower casing heat the air contained in and circulating upwards through, the interior side tubes E—the heated air being discharged into the higher compartment of the upper casing A, and thence into the atmosphere of the room; whilst with the arrangements shown at the right-hand side, the aëriform products of combustion, after passing down the tubes D, are conducted up through the tubes E, and are discharged with the heated air into the apartment. Through the interior of the central tube G another air-tube J passes to the higher compartment of the upper casing; the tube being bent immediately above the funnel H of the burner, and from the knee carried out horizontally to the annular space between the casings of the tube G, from whence the air already partially heated enters the tube J, and is further heated before its discharge into the apartment.

Gas-Engines.—Repland, E.; communicated from P. Niel, of Evreux, France. No. 875; Jan. 17, 1889. [8d.]

This is a compression engine; the cycle of operations beng completed by four strokes of the piston or two revolutions of the shaft. The improvements have for their object to allow the heat of the products of combustion to be utilized for raising the temperature of the air or other non-inflammable gas compressed in another cylinder, and causing the expansion produced thereby to act on the shaft, so as to effect considerable working economy.

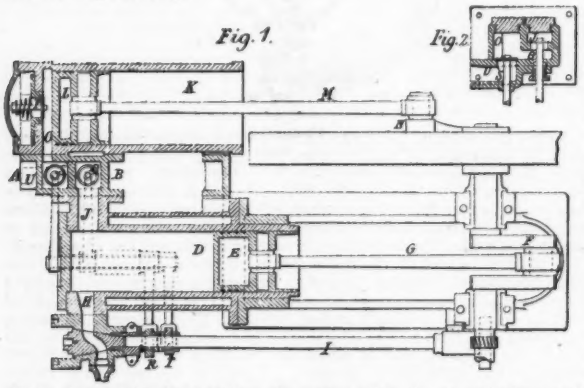


Fig. 1 is a longitudinal section of a motor with the air cylinder; and fig. 2, a cross section.

In the cylinder D works the piston E, actuating with its rod G the crank F. The distribution of air and gas, and the ignition, take place through the lateral duct H; distribution being effected through a conical cock with circular movement by means of the arbor I—one revolution of which corresponds to two revolutions of the shaft. The valve-box (shown in cross section in fig. 2) is attached to the eduction port J; establishing communication between the cylinder D and the air chamber K. In the latter works the piston L, acting by means of the rod M on the crank N, so secured on the shaft of the crank F as to occupy an approximately adverse position to the crank. The piston engages by its progress a volume of air nearly twice as large as that engaged by the piston of the gas motor. At the bottom of the cylinder a space O is provided, forming, together with the valve-box, a compression chamber of sufficient size to allow a pressure to be produced which is approximately equal to that resulting from the products of combustion of the gas motor at the moment of escape. Into the space O an automatic valve P opens for the admission of atmospheric air, by the compression of which it is kept closed. The valve Q, communicating with the eduction port J at its upper end, and with the valve-box at its lower end, is operated by means of levers and a cam R, so as to permit of an escape from the cylinder D into the cylinder K. The other valve S is opened by means of a cam T, to allow of an escape of either air or products of combustion into the atmosphere through the conduit U.

Owing to the relative positions of the two cranks, the piston receives a quantity of air through the valve P, while the piston E compresses its explosive charge. Subsequently the mixture is ignited and expanded in the cylinder D; and during this time the valve S, actuated by the cam T, remains open, and allows the escape into the atmosphere of a portion of the air previously engaged, and amounting to about the volume of the explosive charge taken in by the piston E of the gas motor, in order to permit—since the third stroke, when no explosion has taken place—the charge of the cylinder D to complete that of the cylinder K, and to prevent a prejudicial vacuum being produced behind the piston L. The valve S then closes; and the piston L compresses the remainder of the air in the chamber O. Towards the end of this second stroke the valve Q is opened, and establishes a communication between the mixture of the products of combustion expanded in the cylinder D and the compressed air in the chamber O. The products of combustion communicate their heat to the air; and during the third stroke maintain behind the piston L a greater pressure than that exerted during the compression. Thus, through the difference in the diameters or stroke of the two pistons, increased power is imparted to the crank pin F. During the fourth stroke, the valve Q recloses, and the piston L receives a fresh explosive charge, while the valve S re-opens, and allows the air mixture and the products of combustion repelled by the piston L to escape into the atmosphere, the cycle being thus completed in the two cylinders.

Gas Cooking Burners or Stoves.—Merz, E., of Karlsruhe, Germany. No. 912; Jan. 17, 1889. [11d.]

This invention relates to gas-burners and gas-stoves used for boiling and cooking; and it has for its object to provide a constant supply of hot water—heated by the waste heat from the gas-burner without impeding the supply of air thereto or interfering with the use of the burner or stove for boiling or cooking purposes.

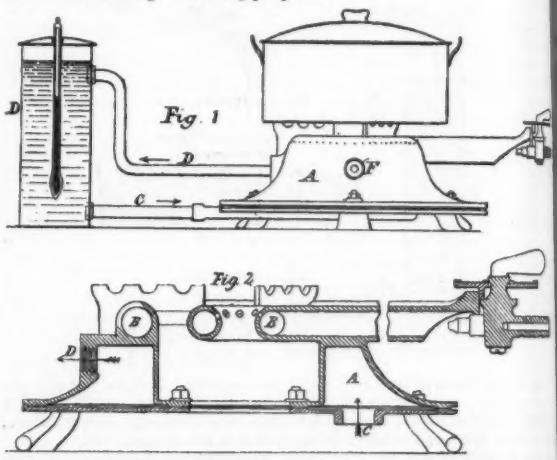


Fig. 1 represents an elevation, and fig. 2 a vertical section of the burner or stove.

A is the main water-heating chamber, placed at the underside of, and in immediate metallic contact with the ring-shaped tube or burner B; being cast in one therewith so as to be heated by conduction, and conforming in its general shape to that of the burner. The chamber is broader in cross sectional area at the base than the diameter of the burner tube; and its sides converge towards the upper part until they merge with the sides of the tube, so that it presents no lateral obstruction which would impede the flow of air to the flames. The water vessel is connected at top and bottom respectively, by flow and return pipes C, with a separate reservoir chamber D, through which a constant circulation of water is maintained so long as the stove is alight. The water chamber is heated by conduction, and also, when a cooking vessel is placed above the burner (as in fig. 1), by the heat confined beneath the bottom of the vessel. The heated water may be drawn off for use from the reservoir D or directly from the water heater by means of pipes screwing on nozzles F if a small quantity only of very hot water is required.

Pontefract New Water-Works.—We recorded last week an extensive subsidence of land at Roall, near Whitley Bridge, where well-sinking operations have for some months been going on in connection with the new supply of water for Pontefract and district. Further extensive subsidences have occurred; and on Monday of last week, the Engineer, Mr. G. Hodson, conferred with the Gas and Water Committee of the Corporation as to the serious nature of events in connection with the undertaking. The depth of the well (120 feet) had been almost reached when the first misfortune overtook the contractors, Messrs. Vickers and Sons, of Nottingham. Additional subsidence, evidently caused by coming upon a "quicksand," renders all further operations on the site futile; and Mr. Hodson recommends that the present site be entirely abandoned, as he does not think it would be safe to erect upon the ground or near the subsidence permanent buildings and machinery. He recommends that further borings be made on the other land purchased by the Corporation. The question is naturally exciting much interest in the town; the scheme from the first having met with great opposition from members of the Corporation and a large section of the ratepayers. Already the cost entailed will reach nearly £1000. The Local Government Board sanctioned a loan of £23,000 for carrying out the proposed scheme; but conditionally that boring and sinking operations be first found satisfactory, and for which purpose a limited sum was fixed upon by them. The Water Committee met last Thursday to consider the suggestions of the Engineer; and at a meeting of the Council on the same day, the statement of the Committee was discussed in private.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Mr. Wyatt's Gasholder Formulæ.

SIR,—I regret that Mr. Wyatt should lead your readers to infer, from the wording of his article in your last issue, that I have used his formulæ for gasholders, merely altering the notation. I can only say that I was in perfect ignorance of all his formulæ until they appeared in the last number of the JOURNAL. If any further proof were needed that I have not founded my formulæ upon his, the following will suffice:—The two formulæ Mr. Wyatt says I "used" are both incorrect, and do not agree with mine.

F. S. CRIPPS.

Sutton (Surrey), Jan. 4, 1890.

P.S.—As Note E, on page 25 of my book (playfully dealt with by Mr. Wyatt) may have caused difficulty to others, I hope to send you an explanation of this point in time for the forthcoming issue of the JOURNAL.—F. S. C.

Is Water Gas Possible in British Gas-Works?

SIR,—Much has been written and told lately respecting the poisonous nature of water gas; and this, I understand, is one amongst other reasons alleged against its use in British gas-works.

The space of one short letter will not allow me to take more than one of the alleged reasons against its use, as set forth by our coal gas friends. But first may I ask, Who has tried the manufacture of water gas in any one of our British gas-works, having in that trial the advantage of all modern improvements now in use for its manufacture? Certainly, it has been tried, though not with all the improvements, but only some special idea of those in charge sought to be established, and which has certainly failed. But what, may I ask, would be the result of a plant erected and fitted with all modern improvements? Certainly, totally different from any result yet established; and though Donovan so long ago tried his idea, and found it to fail, yet the time that has elapsed since then, and the march of sound improvements makes it useless to speak about Donovan or his results as bearing on the water-gas plant of to-day.

With respect to the poisonous nature of water gas first mentioned, it is to my mind a stupid thing to bring forward; for how much carbonic oxide have we present in carburetted water gas? The very fact of its being carburetted reduces the percentage of carbonic oxide present. Then compare it with coal gas. We have about 7 per cent. of carbonic oxide present in coal gas; and I will take it that, supposing we remove from coal gas this carbonic oxide, and attempt to breathe coal gas not containing it, would this not have poisonous properties? Therefore the practical difference to my mind is *nil*. Then, again, take water gas not carburetted, and place one person in an atmosphere of this gas, and another in an atmosphere of coal gas. We should find that, by the time the man in the water gas was unconscious the man in the coal gas would be unable to move; and thus the practical result is the same.

Then, again, are we not playing the same game with respect to water gas as was played with respect to coal gas on the first serious attempt being made to introduce it, after having got over the primary difficulties. Who has not read of great authorities—men at that time considered to be in the front ranks, and in every way capable of forming a true and correct judgment of coal gas—opposing it; and to-day we have the same with regard to the value of water gas. It is no new thing certainly; but it has been allowed to drag behind, and now meets with greater obstruction from the simple fact that those who are interested in gas manufacture have had their thoughts and ideas carried for the most part in another direction—viz., the improvement in the plant and apparatus relating entirely to the manufacture, &c., of coal gas. Coal has been charged into the retorts, distilled, and the residual coke never thought about, more than in respect to drawing it out of the retort at the end of the charge, and getting rid of it—certainly at a price, but not the price obtained when used in generator for the manufacture of water gas.

Without discussing the different systems of manufacture, I think ours the best, and one with which, when fitted complete with our carburetting system, will eclipse all others. But, apart from this, I feel sure—and cannot see any reason against it—that water gas manufactured in British gas-works will prove a great blessing, and be another step forward to bring about that end which is so desirable—viz., gaseous fuel for domestic and manufacturing purposes in place of solid fuel and smoky atmospheres.

R. S. MOSS, Chemist,
British Water Gas Syndicate,

Leeds, Dec. 30, 1889.

The Dangers of Electric Lighting.

SIR,—It is almost unnecessary to preach any further from the text "Dangers of Electric Lighting." But as the so-called danger, though present with us now in its most patent form—powerful for evil from all points of view—has been dinned into our ears till we are all sick of the subject, and longing for the time when electrical work will be carried out in a safe and proper manner, like any other class of engineering work, a word may be excused in your columns, pointing to two recent cases in which gas men probably score a point. Last night a fire broke out in Grosvenor Square, London; the residence of Mr. W. A. T. Amherst, M.P., being supposed to be wrecked through the overheating of an electric wire. Now, may I ask, would the firm who fitted up this house kindly lay bare facts before the electrical and engineering public, and tell us all about the wiring of this last "*electrofeu*." It is only the duty of a contractor to sustain his position before the public when a miserable incident like this occurs. Then, I see that the illness of the Czar is supposed to have been caused by "the fact that His Majesty became excited by the sudden extinction of the electric lights at Gatschina." Is there any reason for this? Culpable carelessness, or something worse, might be found to be at the root of the evil, if one could manage to investigate the matter. But, in any case, there has been a want of business and technical knowledge in allowing an important installation like this to be put up in such a slipshod manner as to permit of an unintentional sudden extinction of the lighting.

I will close with the earnest hope that the new year will see more good solid work, and little or none of the "cheap jack," dangerous kind, of which we have heard enough.

CHARLES H. YEAMAN.

Liverpool, Dec. 31, 1889.

LEGAL INTELLIGENCE.

ESSEX QUARTER SESSIONS.—Tuesday, Dec. 31.

(*Before Sir* HENRY SELWIN-IBBETSON, *Bart., M.P., Chairman, and a Bench of Justices.*)

The Assessment of the Lea Bridge Gas Company's Property.

To-day the Court was occupied for a considerable time in hearing an appeal by the Lea Bridge Gas Company, against the rating of their property in the Parish of Walthamstow.

Mr. LITTLER, Q.C., Mr. W. C. RYDE, and Mr. MURPHY appeared for the appellants; Mr. W. WOOD represented the Overseers; and Mr. WOOLLETT supported the assessment.

Mr. LITTLER said the Company were subjected to very heavy rating. It was, in fact, equal to 5¼d. per 1000 cubic feet of gas sold, which was very much in excess of the amount usually paid by Gas Companies. The district, also, was not one in which the sale of gas increased. He had taken the receipts in 1888, as the last completed year, and they amounted to £13,700. Deducting from this sum the working expenses, rates, and taxes, the receipts were £5893. During the year there had been an advance in the price of coals to the extent of 1s. 4d. per ton; and there had been an increase in wages, which reduced the amount of receipts to £5237.

Mr. *H. E. Jones*, M.Inst.C.E., stated that for the last fourteen years he had been Engineer of the Commercial Gas Company, and had had great experience with gas companies throughout the country. He had inspected the Lea Bridge Gas-Works, which he found to be very well managed. Such a rate as theirs was unknown in the kingdom. The Company had been standing still for some years past, and was not progressing.

Mr. *E. Ryde* also gave evidence, showing the extent to which the works were over-assessed.

Mr. *W. Eaves*, surveyor, having given evidence on behalf of the respondents,

The CHAIRMAN announced that the appeal would be allowed, the rate to be amended to £1173; costs to follow the event.

HIGHGATE PETTY SESSIONS.—Monday, Dec. 30.

(*Before Mr.* C. HORSLEY *and Mr.* F. RECKETT.)

A Gas Consumer's Claim to a Service-Pipe.

To-day Mr. *H. J. Mitchell*, Manager of the Hornsey Gas Company, appeared in answer to a summons, taken out by Mr. William Brown, for having unlawfully detained a certain piece of lead pipe. Complainant had for some time resided in Middle Lane, Hornsey, and was one of the Company's customers. Recently, however, he had removed to Anerley Road, Croydon, and had been sued by the Company for the gas he had consumed.

Complainant stated that he had the gas laid on to his house in Middle Lane; his landlord paying the Gas Company £1 for putting in the pipe from the road to the premises, and he paying 7s. 6d. for connecting the service-pipe with the meter. Just before he left the house, one of the Company's servants called one day in his absence and took away the pipe; and although he had applied for its restitution, they had refused to give it up. He contended that the 7s. 6d. could not be for fixing the pipe, as this only took about half-an-hour; and therefore it must be for the material as well. To this he submitted he was entitled.

Mr. *Mitchell* said the 7s. 6d. charged included everything; though the value of the pipe and connections was more than this. The Company would be bound to keep the pipe, as well as the cock attached thereto, in proper order, and, if necessary, renew it; and they were entitled to charge the cost and 10 per cent. interest on the work. They would have to replace the pipe without charge when worn out; and it was not likely that the Company could give up this portion of the supply plant to their customers.

Mr. HORSLEY said he thought the Company had acted perfectly right. They agreed to lay the main, but the customer was bound to pay for the work entailed in fitting the pipe in question; and it was only upon his agreeing to do so that the connection was made.

Complainant said he considered 7s. 6d. for merely fixing a pipe was a most unreasonable charge.

Mr. RECKETT said it was clear that the Company had only charged for fixing the pipe, which was still their property. The summons must therefore be dismissed with costs.

BOW STREET POLICE COURT.—Thursday, Jan. 2.

(*Before Sir* J. INGHAM.)

The Charge of Inciting to Murder Mr. G. Livesey.

To-day *Henry George Wier*, described as a compositor, was charged on remand with having, on the 22nd of December last, at a meeting in Hyde Park, incited to the murder of Mr. George Livesey. The proceedings on the first hearing were reported last week (p. 1254).

Mr. FORREST FULTON (instructed by Sir A. K. Stephenson, the Public Prosecutor) and Mr. POLLARD appeared on behalf of the Treasury; Mr. LYNN defended accused; and Mr. BESLEY, as before, watched the case on behalf of the London Society of Compositors.

Mr. FULTON said he was instructed to prefer a charge against the prisoner under the 14th section of the Offences against the Person Act, which provided for the punishment of persons for conspiring to commit, or encouraging or persuading to, murder, by the infliction of a term of imprisonment—the maximum being ten years. Having recapitulated the facts of the case, as already reported, he asked that the prisoner should be committed for trial.

The following witnesses were then called:—

Police-constable *Lambert* deposed that he attended what purported to be a meeting of gas-workers on strike, on the 22nd of December, in

Hyde Park. He directed his attention to No. 4 platform, where Mr. Tom M'Carthy was in the chair; the prisoner and others being on the platform. The Chairman made an opening speech, and a person named Tillett proposed a resolution—"That this meeting condemns the endeavours of the South Metropolitan Gas Company to force upon their *employés* the bonus scheme as a seductive bribe to prevent the workers from obtaining their just rights." The prisoner seconded the resolution, and made a speech. Witness could write shorthand, and took notes of a portion of the speech, as follows:—"I can tell you that the 8000 men that I represent are prepared to stand by you to the utmost. I am unable to support you much myself; but I can tell you that my heart is with you. Mr. Livesey has got £40,000. Remember that he got it out of the working men. I say that it is a standing disgrace that he should be allowed to draw it out of you. Why should he be allowed to use it against you? Working men of the country would not put up with it from a Monarch. The sooner he is got rid of the better. He says he will stick to those men who have supported him. I say that he has no right to live; and I say that the man would be a hero that went to-night and murdered him—(cheers, and cries of 'No.')"

Mr. FULTON: That is the way it was received.

Witness: Yes. He proceeded: "I regret to know that the men making the gas to-day are making it in ignorance; and I feel certain that if you could only get hold of them they would side with you. I would make George Livesey make the gas himself. He has said that he is very well satisfied with the men. I think it is a bad job, then, he does not have to make it himself. I ask these men to pass this resolution. Stand shoulder to shoulder, and the compositors will stick to you in your trouble." This was the conclusion of the speech; and Mr. M'Carthy, the Chairman, got up, and addressing the meeting, said: "I must tell you I cannot agree with the remarks of the previous speaker, as to a man being a hero who would murder another man." Shortly afterwards the meeting broke up.

Cross-examined, the witness said the prisoner said a great deal more than he had noted. He selected the part of the speech in which he made mention of the murder of Mr. Livesey.

Mr. *R. G. Emery*, of the *Morning Post* staff, deposed that he attended the meeting in question, and heard the greater part of the prisoner's speech. He said: "I say that a man like Livesey has no right to live, and ought to be got rid of. A man like Livesey has no moral right to live in this country; and the man would be a hero who went to-night and murdered him. Such a man would be a hero, and one we ought to worship." The next sentence was: "There is not much of me; but what there is, I am ready to sacrifice myself for the cause of my fellows." After he had closed his speech, he got down from the cart, and witness asked his name. He replied "Wier," and spelt it.

Thomas M'Carthy, a stevedore who was present on the occasion, said his impression was that prisoner stated that if Mr. Livesey had been in Brazil he would have been got rid of, and that the man who did it would have been considered a hero. Witness became angry, expostulated with the prisoner, and told him he should attack his speech.

Mr. *G. Livesey* deposed that it had been his duty to organize the attempt to counteract the effect of the strike. His attention was directed to the speech made by the prisoner and reported in the public press. He believed he was the person referred to; but he took no action in the matter, and now attended on subpœna.

Inspector *Greet* deposed to arresting the prisoner on a warrant at the office of the London Society of Compositors, Racquet Court, Fleet Street. He admitted speaking at the meeting in Hyde Park. When the warrant was read to him, he said: "That is not true. I was speaking of the £40,000 that had been accumulated by the men that he was fighting them with to-day. I said that the Emperor of Brazil had been turned out for no reason whatever compared with what Mr. Livesey had done; and that if he had been living in Brazil he would not have been allowed to live 24 hours. I was not referring to this country at all, and had no intention to refer to this country. I had no intention of being there. I was with a friend in Hammersmith, and was invited by some person in the Park to second the resolution. I have spoken at heaps of meetings. I should not be so foolish as to ask for a man to be murdered."

Prisoner, who reserved his defence, was formally committed for trial.

LIVERPOOL CITY POLICE COURT.—Thursday, Jan. 2.

(*Before Mr.* RAFFLES, *Stipendiary Magistrate.*)

Alleged Attempt to Defraud the Liverpool Gaslight Company.

Joseph H. Philp, a public-house agent, was charged on remand with having attempted to obtain, by means of false pretences, the sum of £5 from the Liverpool Gas Company.

Mr. MARKS, who appeared for the Company, explained that the prisoner had been carrying on business in a small way as a public-house agent, and thus became acquainted with Mrs. Hill, the licensee of a public-house in Whitechapel. Mrs. Hill required the use of gas on the premises; and it was necessary to make an application to the Gas Company for the supply. The prisoner made the application for Mrs. Hill; but he did not inform the Company that he was not the tenant of the premises. On the contrary, he filled up the usual form as though he were the tenant, and left a deposit of £5 for a meter, the amount that he had received from Mrs. Hill. The meter was supplied; and subsequently the prisoner wrote to the Company asking them to have the state of the meter taken—this being required before any application could be made for the return of the deposit. A record of the gas consumed was taken; and the prisoner then sent a man to the Company's office for the balance of the deposit after deducting the charge for the gas consumed. Information had, however, been received by the Company with respect to the prisoner; and they therefore declined to pay the balance. A warrant was applied for against the prisoner; and he then requested the Company to transfer the meter into the name of Mrs. Hill. He afterwards absconded, and was arrested in Manchester.

Several witnesses having been called in support of the charge, the prisoner, who reserved his defence, was committed for trial; the Magistrate consenting to accept bail, prisoner in his own recognizances of £40, and two sureties of £20 each.

MISCELLANEOUS NEWS.

GAS WORKMEN AND THE LABOUR QUESTION.

The South Metropolitan Company and their Difficulties.

The events of the past week in connection with the agitation among the workmen lately in the service of the South Metropolitan Gas Company, were not of a very important character, and therefore our record of them will not extend to any great length.

On Monday the Strike Committee replied to Mr. Livesey's letter which appeared on the previous Saturday (see last week's JOURNAL, p. 1257). Referring to Mr. Livesey's statement that the bonus might be withdrawn after twelve months' service, by the men giving reasonable notice, the Committee said they now knew what they were not aware of until the letter was published—viz., that by "reasonable notice" he meant one month. They contended that the last pamphlet issued by Mr. Livesey bore out every item discussed in the letter addressed to him by the Committee on the 27th ult.; and that it was he and not the Strike Committee who were trying to mislead the public. "If," said the Committee, "men sign an agreement which may be fair to-day according to Mr. Livesey's bonus scheme, it would only hold good for twelve months, and the men would be at his mercy if he wished to alter it—in particular as the agreements would not terminate on the same date, which would deprive the men of any combined action." The Committee concluded by expressing ignorance of the new paragraph mentioned by Mr. Livesey. With regard to an alleged threat by the President of the Gas Workers' Union (Mr. Hutchins) that The Gaslight and Coke Company's men would be called out if the South Metropolitan Company did not accede to the demands of their men, Mr. Hutchins denied ever having stated that the Committee were going to take any such step; and Mr. Michael Henry (Secretary of the Coal Porters' Union) and a deputation had that day waited upon the Directors of the Chartered Company, and given on his behalf an official contradiction. This had been accepted in good faith. Mr. Hutchins further stated that they were doing their very utmost to fight the South Metropolitan Company in a fair stand-up way. At present they were trying to draw out all the skilled "blacklegs" who had come from Manchester and Salford. The resources of the Company were severely taxed at the opening of the past week. Sunday, the 29th ult., was an exceedingly foggy day; and consequently the energies of all the hands at the various stations were put forth to increase the stock of gas. All the works were fully manned. Unfortunately, a number of men were on the sick-list; but of these very few were suffering from burns or from the results of any accident arising out of their new employment. Colds of a severe character were the universal complaint; and this was scarcely to be wondered at. The new men went in and out of the works freely, without meeting any molestation worthy of mention; but arrangements were being made for providing quarters for them outside the works.

On Tuesday it was rumoured that proposals were about to be offered to the Directors of the Company, with respect to the profit-sharing scheme, which it was hoped would prove an acceptable compromise on both sides. This result, if it came to pass, would be the outcome of a deputation headed by Mr. E. O. Greening, of the Co-operative Labour Movement, which waited on the Central Strike Committee and made certain proposals to them, which they were strongly disposed to accept. The Strike Committee succeeded on the previous day in despatching two fresh batches of Manchester stokers back to their homes. The officials of the Company, however, were glad to be rid of these men, whose conduct was anything but satisfactory. The Sailors' and Firemen's Union commenced action to-day, by picketing all the Company's jetties.

Wednesday was the Company's Board day; but up to the time of rising, no further communication had been received from the Strike Committee. In consequence of the intimation that the River Thames was being picketed by the members of the Sailors' and Firemen's Union, with the view of stopping the coal supplies, Mr. Frank Livesey had an interview with the chief officials of the Thames Police on Tuesday; and arrangements were then made to protect the Company's vessels from being boarded by the pickets. The stock of coal at all the stations was larger, Mr. Livesey stated, than it was this time last year; and there was a good supply of steamers on their way to London. The strikers were exceedingly jubilant over their withdrawal of a large number of the Manchester stokers who had been brought up to London and set to work at the Old Kent Road and Rotherhithe. But, as already stated, the Managers were glad to get rid of them all, except a few who had turned out thoroughly good men, and were sticking to the Company. A number of the old stokers had returned, and were passing freely in and out of the works without molestation. As a further evidence of the eagerness with which the men were returning to their former duties, twelve of the coal porters who had applied to be reinstated at West Greenwich, had signed the twelve months' agreement *minus* the bonus, which was refused on account of their behaviour in turning out with the stokers, in direct opposition to all previous promises faithfully made that they would remain in if not put to do stokers' work. In the evening a mass meeting was held in Lambeth. Between 2000 and 3000 men marched in procession from the Old Kent Road. Mr. Hutchins proposed a resolution pledging the meeting to support the others on strike, and it was carried with enthusiasm.

Thursday was a rather eventful day. In the first place, the strike entered the fourth week of its existence; then the pickets of the Sailors' and Firemen's Union delayed the unloading of some of the Company's coal vessels by inducing several of the hands to leave; and, lastly, Mr. Wier, whose indiscreet utterances at the meeting of stokers in Hyde Park on the 22nd ult. had been brought under the notice of the Public Prosecutor, was committed for trial on a charge of inciting to murder Mr. George Livesey. More of the old hands had resumed work; and, in order to prevent this example spreading, the Strike Committee issued a notice that any of the stokers seen entering the works would be removed from the pay-list. The Strike Committee had under consideration a scheme of profit-sharing which they thought would fall in with Mr. Livesey's views, and at the same time remove

the objections of the men; but after long debates, they decided not to move in the matter until they had seen the result of the picketing of the coal vessels. The literature of the strike movement was increased to-day by the publication of the following letter (signed, on behalf of bonus men at East Greenwich, by S. G. Stubbington) in several of the London papers:—

Many speeches and manifestoes of the men now out on strike having been published in the daily press, as old hands of the South Metropolitan Gas Company, who have taken advantage of the profit-sharing scheme, we ask for publicity of the following protest against the insults and abuse heaped upon Mr. George Livesey, and for a statement of our view of the present difficulty.

First, we beg to protest most earnestly against the suggestion of the men, that Mr. Livesey's word is not be relied upon, and to state that during the time we have worked for the Company we have received most generous treatment, and have often found him willing to exceed his promise, but never to withdraw from his word; so much so that we not only feel for him the respect due to an employer, but the affection due to a friend.

The strikers say they have done all they could to prevent a strike. We ask them, if they can do so honestly, to deny the following statement:—The eight hours was granted at once, at prices agreed to by the men; the Company, of their own free will, adding 1s. 6d. per week to stokers, and 1s. per week to fire-rakers and coal-wheelers who made full time. The delegates of the men signed an agreement that they would work with non-Union men; but within two months of doing so, threw down their tools and refused to work unless a few men (non-Unionists) working in the retort-house were turned out. They agreed to work for ordinary pay at all times excepting from six o'clock on Sunday morning till six o'clock on Sunday evening, and if required to work between these hours, for time-and-a-half; yet they again broke their word, and refused to work from six o'clock till ten o'clock on Sunday evening for less than double pay. These men, who have again and again broke their word, try to cast a slur on the honour of a man who had always kept his.

Mr. Livesey says his object in bringing forward the profit-sharing scheme was to give the men an interest in their work greater than could be expected for mere wages. The offer was made to all permanent hands; but, so far from anyone being compelled to sign it, no one was allowed to do so unless he was an established hand. But in order that the winter hands should have no cause of complaint, it was offered to them for six or three months' service, instead of for twelve months, as in the case of the regular hands.

We recognize in the plan a step in the right direction towards a settlement of the labour difficulty, as by its provisions the worker has an immediate share in the profits of his employment; and if he will allow his share to accumulate, can have it transferred into Company's stock, and thus become partially his own employer. If all the bonus men (about 1000) did this, in three years at least £14,000 worth of the Company's stock would be the property of the workers. As long as men work for mere wages, these troubles must arise; but when men share in the profits of their employment, they will recognize the fact that their employers' interests are their own. We see also a provision for old age without stinting ourselves at present, as in ten years, at the lowest wages paid, a man's share would be £42, and in 20 years over £100.

The strikers say we are selling our liberty of action. We reply that we prefer entering into a perfectly fair agreement with our employers for twelve months (work for that time being guaranteed), for good wages, and an additional 5 per cent., to submitting to the tyranny of a Union which says, "Join us or starve; for if you do not belong to us, you shall not work."

Friday was signalized by the issue to the consumers of the Company of a statement, signed by the Secretary (Mr. Frank Bush), thanking them for their forbearance and sympathy during the crisis, and setting forth the reasons which prompted the Directors to take a firm position in the dispute with their men. After quoting in full the memorable resolution passed by the Executive Committee of the Union on the 4th ult., demanding the withdrawal of the bonus scheme and the removal of the men who had accepted it, Mr. Bush said: "This was a demand for the dismissal of about 1000 loyal men who were working under agreement. It being refused, the whole body of the stokers gave their notices on the 5th, and they left their work on the 12th of December; thus placing the entire supply of gas to South London in imminent peril. The Directors desire to express their regret for any inconvenience the consumers have suffered during the last month in consequence of the strike. They also offer their most hearty thanks to the consumers for their ready sympathy and goodwill, especially for their assistance in economizing gas when it was most needed, and when such aid was invaluable to the Company. The difficulties of maintaining the supply of gas have been very great, and the expenses have been also very heavy; but the Directors have the satisfaction to inform the consumers that it is not their intention to increase the price of gas to meet any part of those expenses. They may, however, add as some consolation for the inconvenience that has been so cheerfully borne, that had a stand not been made against the unreasonable demands of the Gas Workers' Union, those demands were growing so fast that a considerable increase in the price of gas would soon have become an absolute necessity. A permanent increase of price would have been a greater disadvantage to the consumers than the temporary inconvenience to which they have been subjected." Later in the day the following manifesto (signed on behalf of the Gas Stokers', Coal Porters', and Sailors' and Firemen's Unions, by Mark Hutchins, Henry Brill, and George Fysh) was issued in reply to the foregoing statements:—

Mr. Livesey's statement in to-day's papers is designedly intended to mislead the public and misrepresent the strikers' attitude. The lie, already freely used, that we demanded the discharge of the 1000 men who signed the agreement is again repeated by Mr. Bush on behalf of Mr. Livesey. This is beyond endurance, as Mr. Livesey knows well that immediately the notice in question had been despatched to him, the Committee discovered the clerical error, and on the moment despatched a registered letter to Mr. George Livesey containing the correction. Mr. Livesey therefore knows that we did not demand the discharge of the 1000 men; and he has no right to make the statement again and again. What we demanded was that the agreement that bound men to work for the Company for twelve months, and which agreements, by being signed at varying periods, would, by leaving at no time more than a few score of men at liberty, smash the Union—we demanded the withdrawal of these agreements. We said again and again that we had no objection to profit-sharing; but that we could not accept a bonus of an uncertain nature, when it was hampered by an agreement which would make the men absolutely powerless to resist any injustice, and which would compel coal porters to do gas stokers' work, and thus become "blacklegs." Further, Mr. Livesey, who said on Dec. 5 that he was bound by the agreements the 1000 men had signed, has since absolutely eaten his own words, and admitted, what we then knew to be the fact, but which was denied by him, that the agreements had been so altered that there were absolutely no legal agreements existing, and that the whole question was to be afterwards settled by mutual arrangement between employers and employed. Mr. Livesey was therefore in no way bound absolutely. The real objection—that of the twelve months' agreement—Mr. Livesey would not withdraw. The offer of the men to consider any reasonable agreement to be signed or terminate all at the same date, has been rejected. It is idle, therefore, for Mr. Livesey to pose as a martyr.

As to his threat to the consumers to increase the price of gas unless they suffer the present inconvenience, and his allegation that the unreasonable demands of the gas stokers would increase it, had they not been resisted, the public should know that the men's demands have at no time been for an advance of wages, but solely for reduction of the hours of labour, so that more working men might find employment, and the vast army of unemployed be reduced. This was a real public benefit, and at no cost whatever to the public, as the Gas Company still paid its enormous dividend; the only difference being that the "spoil" from the public was not divided so largely amongst interested persons, but a larger share of it given to workmen—not in increasing individual wages, but in reducing the unemployed and saving the rates.

In Mr. Livesey's wholly indefensible attack on us, the public have helped him by accepting half-pressure and unpurified gas, although they will have to pay the same as if they received pure gas and of sufficient illuminating power. The blindness of public and press, and the manner in which the Government has gone out of its way to aid Mr. Livesey, may well cause workmen to despair of justice to their reasonable demands—and that they were reasonable the public should not forget was testified to by the Mansion House Council of Conciliation, consisting of his Eminence Cardinal Manning, the Lord Mayor, and other impartial gentlemen, who were astonished at Mr. Livesey's obstinacy. The strikers have shown every moderation under abuse, slander, and public hostility, and should the strike cause a cessation of the whole of the coaling and lighting of London, and the strike become a general one, instead of the partial one it now is, the Government, by thus straining its powers to support the South Metropolitan Gas Company, and the public by their apathy and refusal to institute prosecutions against the Company, will have themselves to blame for having forced a general strike; as, at all costs, Mr. Livesey will not be allowed to trample his way over workmen's combinations and smash Trade Unions at his pleasure.

Information reached the officials at the Old Kent Road that, in addition to the men whom the pickets succeeded in calling out from the coal ship *Kingmoor* at West Greenwich on the previous day, the whole of the men belonging to the *Presco* had left their vessel as she lay alongside the jetty at West Greenwich, and, after going ashore, had declined to return to their posts. The Company, it may be stated, have no ships of their own, but charter whatever number they require. There is therefore no obligation on the part of the Company to find men to take the places of those who deserted the vessels at the call of the pickets; but Mr. F. Livesey felt it his duty to render the captains all the assistance possible, and made arrangements by which the vessel could at once proceed. The crew of the *Kingmoor* had been made up from sailor firemen who had come into the Company's service with the new hands as gas stokers. The *Presco* could have been supplied with her men from the same class; but Mr. Livesey preferred to keep them in the retort-houses. A crew of non-Union men had been engaged to bring this vessel to the Company's works. In the case of both ships, it was ascertained that the men had been got hold of by the pickets while on shore, and not while on board the vessels, as had been supposed. A notice was posted up at each of the Company's stations informing the men that the gratuity in addition to wages which was promised would cease at the end of the week. After the current week the regular men will be able to withdraw the whole of the gratuity; and the new men were informed that they will only be fed and lodged till they can obtain quarters outside; and that upon their doing so, one-half of the gratuity will be paid to them, and the other half in a fortnight. The deputation from the Co-operative Labour Union who, headed by Mr. E. O. Greening, had an interview with Mr. G. Livesey on the 21st ult., as reported in the JOURNAL last week, had a further conference with him, in company with Mr. White (a Director), Mr. F. Livesey, and Mr. Bush, at the Old Kent Road, for the purpose of ascertaining whether the Directors would accept modifications of the bonus scheme, providing the men were willing to consent to them. Three proposals were brought forward by Mr. Greening. The first was that all agreements should be quarterly, and should terminate on the same day; the men to guarantee that no strike should take place during the next twelve months. The second was that the men should be required to "obey the reasonable orders of the foremen," instead of "the orders of the foreman," as in the present form of agreement. The third related to the constitution of the proposed Committee of officers selected by the Company, and representatives of the men, and expressly stipulated that the Chairman (who is to be the Chairman of the Company) should have no casting vote. The deputation were evidently under the impression that if such modifications could be mutually agreed upon, the Company would then take the men back in a body; but Mr. G. Livesey at once assured them that he declined to recognize the present turn-out as a strike. The men had left their work, and applications to return would only be considered singly, and as vacancies arose. As to the proposals themselves, the Company would not accept the three months' agreements, nor the limitation that the men should only obey the "reasonable" orders of the foremen, as this could only lead to endless difficulties. As to the third point, it had been conceded long ago. Mr. Livesey said he had not the slightest desire to vote, and had arranged that any cases of difficulty should be settled by an arbitrator. The members of the deputation communicated their proposals and the result of their interview to the newspapers, and remarked that, as far as they could see, what had to be overcome was not so much a difference of views between the parties, as a state of feeling which prevented meeting for a final adjustment. This could, they thought, only be effectually removed by a general demand on the part of the public for a prompt and peaceful ending of the dispute, in the promotion of which the assistance of the Press was requested.

The issue of the notice on Friday that the new hands were to find lodgings outside the works in the course of the current week led the Strike Committee to take prompt action with the view of preventing this. They circulated a number of handbills cautioning lodging-house keepers against taking in the new hands, with the result that the men were unable to find shelter. The Directors have consequently undertaken to continue for the present the existing arrangements.

A few additional cases of assaulting the police while engaged on

special "protection" duty came before Mr. Kennedy at the Greenwich Police Court on Monday last week. *Frederick Fryer* was charged with having, on the 21st ult., assaulted Police-constable Batey in Marsh Lane, Greenwich. On the day in question, there was a great disturbance among the strikers in the vicinity of the East Greenwich works of the Company. Several constables were attacked with heavy stones, one of which struck a sergeant, and caused concussion of the brain. It was proved that the prisoner struck Batey a blow on the head with a large stone. Mr. Kennedy committed him for three months' hard labour. *James Curley* was charged on a warrant with assaulting Police-constable Bradshaw on the same day. He was fined 40s., or a month's hard labour. *Henry Dove* was committed for a month's hard labour for assaulting two constables. *William Hooker* was also sentenced to six weeks' hard labour for assaulting a fireman in the Company's employment. At the Greenwich Police Court last Saturday, *Thomas Bolling* was charged with intimidation and assault in connection with the recent strike. This was stated by the Gas Company's solicitor to have been a gross case of picketing; and the charge having been proved, the Magistrate (Mr. Kennedy) committed the prisoner for a month, with hard labour—remarking that such tyranny as that of which he had been guilty could not be permitted. Two other men, named *Scott* and *Stewart*, were charged on remand with assaulting one of the Company's new hands, and were each fined 30s., or one month's hard labour.

In connection with the change of workmen there have necessarily been several accidents; and, unfortunately a few fatalities have to be recorded. One occurred to a man named Gibbons, a farm labourer, who was sent to the Surrey Docks, at Rotherhithe, on Sunday, the 22nd ult., to unload coal. Deceased was walking along the quay at midnight to his sleeping quarters, in the company of the other men, attended by a policeman carrying a lantern; but instead of keeping with the party he left them, and before he could be warned he fell into the dock and was drowned. Another case was that of a man from Brighton, named Flaherty, who, while moving some trucks, was accidentally squeezed between them. He was not seriously injured; but an attack of acute bronchitis supervened, and with this he succumbed on Christmas Day. Last Friday an inquest was held on the body of John Cook, a labourer from Lincolnshire, who died on the previous Tuesday in St. Thomas's Hospital from injuries sustained at the Vauxhall station of the Company. To all appearance the man was strong and healthy when he was engaged with other new hands on the 13th ult.; but a few days after Christmas, he was reported as being ill, and was removed to the hospital. It appeared from the evidence that, while deceased was wheeling a barrow of coke up a plank, he slipped and fell; the barrow falling with him. The immediate cause of death was stated to be septic poisoning, consequent upon erysipelas setting in from the injury sustained in the fall. In this, as in the first case, a verdict of "Accidental death" was recorded; in the other the death was found to have been due to natural causes.

It was stated last Sunday by Mr. Mark Hutchins that the Sailors' and Firemen's Union are prepared to spend £30,000, if necessary, in order to stop the Company's coal supplies; and in return it is expected that such combination will be effected in London that none but Union men will be employed in manning or unloading vessels. During the progress of a demonstration held in Southwark Park in the afternoon, news reached Mr. Hutchins that another crew had given in notices to leave yesterday morning a coal ship lying in the Surrey Commercial Docks ready for unloading into the Company's barges, and intended for the Old Kent Road works. The men evidently placed the greatest hope in this new phase of the dispute, and seemed to believe that the coal supply would be absolutely exhausted in a few days. On the other hand, Mr. Livesey states that all the harm the men have been able to do, after three weeks' struggle, is to reduce the stock by about 3000 tons. As to getting fresh crews, Mr. Frank Livesey stated on Saturday that the Company can now command any number of non-Union men that they may require from London alone. The ship *Presto*, the crew of which had left in a body on Friday, had been re-manned, and would at once be got away. The steamer *Chester*, belonging to Messrs. Pyman Brothers, was, we learn, boarded on Sunday afternoon, on arriving in Deptford Creek with coals for the Company, by pickets of the Sailors' and Firemen's Union, who induced the whole of the crew to leave. The steamer *Cheeswater* arrived in the Surrey Commercial Docks with a similar cargo. Two of the firemen left at once; but, the captain having refused the sailors a pass out of the dock for their clothing, the remainder of the crew continued on board.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Magistrates and the Quality of the Gas.

A Special Meeting of the Birmingham City Magistrates was held last Wednesday, to receive among other reports one from the Gas-Meter Inspection Committee. The Committee reported that the illuminating power of the gas had, during the past twelve months, been equal to that supplied in former years. During the year 10,593 meters had been tested; and the fees had amounted to £402 18s. The number of meters rejected was 141. At the various works, 208 tests of the illuminating power of the gas had been made, giving an average of 17·33 candles. The highest test was 17·89 candles, and the lowest 16·70 candles.

Alderman MANTON having moved the adoption of the report,

Mr. ARTHUR CHAMBERLAIN said he considered that the Committee occupied a false position before the public in regard to the testing of the gas. They reported fortnightly that the gas was equal to so many candles; and it was extraordinary to see how regularly the illuminating power was put at 17·2 or 17·3 candles, although it was within their knowledge as consumers that the illumination varied considerably in different places. Certain reasons for these variations were given by the gas authorities; but there was one which seldom came before the public—that the pressure of the gas varied at the works according to the pleasure of the Engineers, and that while 17-candle power might be registered at one place at one moment, at another, with exactly the same kind of burner, the illuminating power would be 2 or 3 candles candles lower. Then it should also be remembered that these tests were taken at the works; and when the public read in the newspapers that the illuminating power was 17·3 candles, they were naturally led to suppose that this was the record of the illuminating power where they burnt it. On the contrary the probability was that the gas as consumed in the houses would be no more than 12 or 13 candle power. All they were required by law to provide was gas of 15-candle power; and in stating that it was 17·2 candles, they not only went beyond what was legally necessary, but were deceiving the public, not only as to the exact quality of the gas, but by leading them to suppose that the illuminating power did not vary. The public ought to understand that the pressure was altered without the control or the consent of the Committee, and that this caused the illuminating power to vary. In the interests alike of the public and the Gas Department of the City Council, reliable data ought to be published. In order to obtain this reliable information, testings ought to be made not only at the works but at different parts of the town, and published every fortnight.

Alderman MANTON pointed out that what Mr. Chamberlain proposed had already been done. Tests had been made at twenty different establishments in the town; and any manufacturer could have a test made on payment of half a guinea. These testings showed that the illuminating power did not vary half a candle. The illuminating power power varied at the different works; and the reports published showed the average.

Mr. HAWKES denied that what Mr. Chamberlain wanted was at present being done.

The MAYOR thought they ought not to mix up the statutory duties of the Committee with outside work with which they had no business. The Act required that the gas should be tested in a certain manner; and their duty was then done. If they went amateuring about as gas inspectors, they would be introducing a bad precedent, and might mislead the public. It was generally understood that the science of gas-testing was in a very unsatisfactory and unreliable state. Some good might result from Mr. Chamberlain's suggestions if he were put upon the Committee in the place of Mr. Stone, who retired; and he moved his appointment.

Mr. ARTHUR CHAMBERLAIN said that after the Mayor's remarks as to the undesirability of the Committee undertaking any work which they were not required by law to do, although they had exceeded that limit, he saw no use in his being appointed upon the Committee, whose duties were not only deceptive but useless. He therefore declined to serve. He subsequently moved—"That it be an instruction to the Committee to take tests of the pressure and illuminating power of the gas at different parts of the city in the same way as at the gas-works, and that the result of the testings be made public in any way the Committee thinks fit."

The motion was unanimously adopted; and Mr. H. P. Ryland was elected on the Committee in the place of Mr. Stone.

LEEDS CORPORATION GAS-WORKS.

Purchase of Additional Land.

At a Special Meeting of the Leeds County Council last Wednesday, Alderman Gilston moved—"That the Council approve the purchase by the Gas Committee of Lots 5 and 6 of the Leeds Iron-Works Estate, comprising 24,368 square yards or thereabouts, with the buildings thereon, at the price of 7s. per yard, subject to a contract to be approved by the Town Clerk." He said the members would be aware that in their gas-works at York Street, Meadow Lane, and New Wortley, they had reached to the full extent of capacity and of their powers of production. They had now a very favourable opportunity of obtaining the means of extending their works as their requirements arose. By acquiring the property mentioned in the resolution, they would be brought into direct communication with the Midland Railway Company and the Middleton Colliery Company, and would be able to carry their coal by an overhead railway and deliver it into the retort-houses at less cost than at present. The Committee were satisfied that at this time they could not do better than advise the Council to purchase the land. They believed that the gas undertaking would increase year by year. The increase for the past half year was between 12 and 13 per cent. upon the corresponding period of last year. There were other two lots, but the vendors would not treat at a less price than 9s. per yard for them. Mr. Ambler, in seconding the resolution, said he thought the Committee had a right to claim some little credit in this matter. The amount first asked for the land and buildings was £14,539, and £12,301 was next asked; but as the result of the negotiations, they had acquired the property for £8528. Several other members spoke in support of the resolution; and an opinion was expressed that the Committee should endeavour to secure the other lots referred to. Alderman Gilston said that, after this expression of opinion, the Committee would make further inquiry about the other portions of land. The resolution was adopted.

Bilston Gas Company.—The report presented at the annual meeting of the shareholders of this Company yesterday was a very favourable one. It stated that there had been the gratifying increase in the sales of gas, of 4½ million cubic feet; and that there was a balance to profit and loss account, of £5352. From this sum dividends of 5s. and 3s. 6d. per share on the "A" and "B" shares respectively were declared; making with the interim dividends 10s. and 7s. for the year. After deducting £250 for the insurance fund, there remains a sum of £2687 to be carried to the current year's account.

The Backward Thirlmere Water-Works Contract.—Mr. T. W. Chester, one of the contractors for the Thirlmere aqueduct, has brought an action against the Corporation of Manchester to restrain them from acting on the notice they gave on Christmas Eve in accordance with the motion passed at a special meeting on the previous day, to seize and take possession of the works for which he has contracted, and the plant and materials thereon. Last Saturday week Mr. Chester's Counsel (Mr. Ashton Cross) obtained from Mr. Justice Denman, sitting as Vacation Judge, an order for an injunction restraining the Corporation from taking possession of the works and plant over the first motion day of next sittings, the 11th inst.

THE QUALITY OF THE GAS SUPPLY AT BRISTOL.

The quality of the gas supplied in Bristol forms a subject for perpetual complaint to the local authorities, and of discussion by them. The Sanitary Authority, it will be remembered, recently appointed a Committee to report upon the matter; and now the Town Council have referred to the Sanitary Committee for consideration a resolution, which was read at their meeting last Wednesday, from a body known as the St. Philip's (North) Independent Ratepayers' League, complaining of the defective street lighting of the city. The remarks made by various members of the Council after the resolution had been read, show that most of them are of opinion that the illuminating power of the gas ought to be improved. Alderman Proctor Baker, who moved that the matter be referred to the Sanitary Committee, declared that there was a universal outcry about the bad lighting of the city, and the wretched supply of gas for domestic purposes and shops. Whether or not these complaints were justified was a matter which he did not wish to prejudge; but personal comparisons with other places were not favourable to Bristol. The city, he reminded the members, had made with the Gas Company a certain contract, which was contained in the Act of Parliament; and if the Company fulfilled their obligations under the Act, the city could not go any further or complain. They were then met with the question, how were they to get out of the present difficulty? To him the practical steps that might be taken seemed to be that the city should buy the Company's undertaking, take the matter into their own hands, and supply gas which would be satisfactory to the citizens. Or they might apply to Parliament for permission to set up a competitive system of lighting; but still he thought it would be an unfortunate thing if that occurred. There was a third way out of the difficulty—that of negotiating with the Company for the supply of a better quality of gas, and to offer to pay them for improving the supply. Some time ago a gentleman who was then a Director of the Company submitted a sliding-scale scheme to him, giving to the Company a higher payment for a better supply of gas; and this was the principle he (Alderman Baker) considered ought to be proceeded upon. He thought the city should move, and see if better gas could not be supplied to the inhabitants. There were other means of forcing the hands of the Gas Company, by introducing the electric light. The Mayor, who is Chairman of the Electric Lighting Committee, intimated that in the course of a month he hoped to be able to give some information on the subject of lighting. Mr. Lockley pointed out that only once recently had the Inspector found the gas to be below the standard. He also stated that the Directors had given instructions that at their three several works the gas should be kept up to 16-candle power; and a sub-Committee had been appointed to inquire into the matter, with a view of obtaining an improved gas supply. Mr. Levy, a large consumer of gas, said that although he paid for his supply, he obtained very little light. Sir Joseph Weston believed that the illuminating power of the gas now furnished to the public lamps was better than it was some years ago; and in his opinion bad fittings were responsible for many of the complaints. Mr. Dix was of a like opinion; and he averred that the average illuminating power of the gas was 16 candles, whereas the Company were not bound to supply more than 13½-candle gas. Mr. Williams suggested that, if needful, the consumers should pay an increased sum for gas, and the Company use a better class of coal. Mr. Pearson did not agree with Sir Joseph Weston that the fittings were to be blamed for the defective illuminating power; his experience being entirely contrary. As already mentioned, the motion by Alderman Baker was adopted.

Conviction for Stealing Gas.—Last week Richard Rose was indicted at the Middlesex Quarter Sessions for stealing gas from the Brentford Gas Company. The prisoner formerly resided at No. 22, Eton Rise, Ealing; and, in consequence of the non-payment of his gas bill, the prosecutors ordered the supply to be cut off in June of last year. In November, by order of the Grand Junction Water Company, a man was sent to disconnect the water supply. This man noticed that the gas was burning in the conservatory, and that at the place where it had been cut off a bladder had been affixed, through which there was let in a supply of gas to the house. The defence was that there was no evidence to show the defendant had been a party to stealing the gas; and that he was a man of such high character that it was extremely unlikely he would commit such an offence. He was nevertheless found guilty, and sentenced to three months'. imprisonment with hard labour.

The Accident at the Saltley (Birmingham) Gas-Works.—Mr. Edwin Smith, the Secretary of the Birmingham Corporation Gas Department, has forwarded to the press for publication the following resolution in regard to the deplorable accident at the Saltley works, which was passed at a recent meeting of the Gas Committee:—"Resolved: That the Gas Committee desire to express its great regret at the deaths by accident at the Saltley Gas-Works, of Thomas Case and James Chew, while bravely rescuing their fellow workmen from danger, and its sympathy with their families in the most sad loss which they have sustained." The Committee also voted the sum of £50, to be applied to the relief of the families of the deceased men, and in recognition of the bravery of Richard Smith. A meeting of the Committee formed for the purpose of receiving and applying the fund subscribed for the relief of the widows and children of the deceased men was held on the 31st ult. Sir Thomas Martineau was elected Chairman of the Committee and Treasurer of the fund; and Mr. Arthur Smith (of No. 57, Temple Row, Birmingham), was appointed Hon. Secretary. The Treasurer was authorized to take the money which the editors of the local papers have been kind enough to receive, and any further subscriptions may be sent to him. Nothing has at present been decided as to how the money shall be applied; but Sir Thomas Martineau will see that in the meantime the families have all necessary funds. It is stated that an application is to be made to the Royal Humane Society with a view to their awarding a medal to Richard Smith in recognition of his conspicuous bravery.

THE MARKET FOR SULPHATE OF AMMONIA DURING THE PAST YEAR.

As on previous occasions, we have received from Messrs. Bradbury and Hirsch, of Mason's Buildings, Liverpool, a copy of their interesting "Annual Review of the Market for Sulphate of Ammonia," for notice in our columns. It consists, as before, of some general remarks on the positions occupied in commerce by this valuable product and nitrate of soda, and a review of the course of the markets month by month during the past year; the usual tabulated statistics being given at the end.

The authors commence by referring to a remark made in the "Review" for 1888, to the effect that the difference in values between sulphate of ammonia and nitrate of soda must be calculated at not more than £1 per ton; and they go on to say that, although in reality the margin in the spring of last year was not much more than this figure, and although, in fact, it was less during a brief period in March, their statement was refuted by the prices ruling during the whole of the rest of the year, and therefore they say they cheerfully return to their previous opinions—which they only abandoned for the first time last year under the overwhelming weight of circumstances—that the difference of about £2 10s. per ton is what may be expected to prevail. Having given this explanation, they proceed to discuss the influence of nitrate of soda on the value of sulphate of ammonia. They find that in January, February, and early March, nitrate was repeatedly quoted at 11s. per cwt.; while sulphate at the same time was £12 10s., £12 2s. 6d., and £11 16s. 3d. respectively. At the end of March, sulphate was quoted at £11 18s. 9d.; nitrate, at 10s. 6d. During the second half of April, sulphate was at the same price (£11 18s. 9d.); nitrate, at 9s. 6d. In May, the price of sulphate was unchanged; that of nitrate was 8s. 6d.—showing that sulphate practically remained unmoved, while nitrate fell £1 per ton in each of these months. The identical case recurred in June and August. After these periods a wider margin was noticed, for in September nitrate was at 8s. 4½d.; sulphate, at £12 2s. 6d. This margin was slightly reduced during November; but again considerably widened during December—nitrate, after touching 8s. 9d., relapsing to 8s. 4½d.; while sulphate stood at £12 5s. The cause of this lowering of prices for nitrate is then considered; and the authors put it in two words—"inflated values." The rise chronicled in 1888 had proved to be due entirely to the manipulations of importers and speculators. The inevitable result followed. Heavy shipments dispelled the idea of any short supplies last spring; cargoes, owing to a prevalence of westerly winds, arrived much sooner than usual; and farmers, in view of the prices asked, did not hasten to cover in their spring supplies. Simultaneously the demand was disappointing; and those who unreasonably expected it to make the same strides as in the spring of 1888, found their hopes far from realized. The increase in the consumption last year was not more than 20,000 tons, against 100,000 tons in 1888. The drop in the value of nitrate was never quite overcome during the year; and Messrs. Bradbury and Hirsch consider that, unless the production is very considerably reduced, nothing can save prices from a further downhill course. The increased number of producers, however, precludes a reduction of supplies in a natural way; while the Chilian Government, deriving a large revenue from this trade, would certainly not permit any monopoly likely to prejudice it. Almost everything seems to depend upon an increased consumption; and this can apparently only be stimulated by still lower prices. When nitrate can be sold at something like £7 per ton, then, and not till then will, in the authors' opinion, come the halcyon days of consumption which are at present hoped for.

Having reviewed the position and probabilities of the nitrate market, Messrs. Bradbury and Hirsch discuss the merits of the sulphate market. Sulphate advanced at the end of 1888, in sympathy with nitrate, only in so far as there were doubts entertained at the time about a sufficient supply of the latter for spring delivery; and in this event an extreme value of this product would have made sulphate a really cheap commodity. Sulphate did not follow the subsequent decline of nitrate; on the contrary, the margin was widened. In fact, almost for the whole of last year sulphate, so to speak, "stood upon its own legs;" and it is the authors' opinion that it will do so in the future. This means that demand and supply alone will influence the market, and that the importance of nitrate, except as a matter of sentiment and during excited times, will be *nil*. And why, they ask, should it be otherwise? We have in nitrate an almost inexhaustible and unlimited supply, reaching at present nearly 900,000 tons annually, while the production of sulphate has, by slow stages, crept up only to about 180,000 tons in Europe; and all this in view of an increasing demand, which defied all statements to the effect that nitrate would usurp the place of sulphate—as it should have done ere this if the statements and predictions of foreign chemists and others had in the slightest degree proved true. According to a statement of the annual imports of nitrate and the prices, as well as the production of sulphate and its values, during the past 20 years, which the authors give, the imports of nitrate into Europe in 1870 amounted to 100,000 tons; the average price being 15s. 3d. per cwt.; in 1880, the quantity was 140,000 tons, and the price 15s. 8d. per cwt.; in 1889, the imports reached 760,000 tons, and the price was 9s. 2d. per cwt. With regard to sulphate, the production in the United Kingdom in 1870 was 40,000 tons, and the average price £16 per ton; in 1880, it was 60,000 tons, and the price was £19; in 1889, it was 132,000 tons, and the price averaged £12 1s. 4½d. In view of the figures they give, and of past events, the authors hold strong views as to the future maintenance of sulphate values, however cheap nitrate may become. There has never, to their minds, been sufficient reason for sulphate coming down to its present level, nor why in 1883 it dropped from about £19 to £13 in the brief space of twelve months, except by entirely speculative manœuvres. They consider that sulphate is in a stronger position now than it has ever occupied. The demand since last May has been exceptionally good; and it must, they think, be assumed that sulphate has been used everywhere to a larger extent. Users of nitrate, they learn, are inclined to return to sulphate, because they found nitrate too powerful a tonic for many lands, especially light, poor soils; and it seems clear, at all

events from last year's experience, that sulphate is in greater demand during a wet season. Indeed, in the event of a cycle of wet seasons, of which there is a probability after so many dry ones, there would be every prospect of a large increase in the consumption of sulphate. In the home consumption are also comprehended new and increasing outlets; for besides the large absorption by alkali works, dyers, druggists, &c., uses have been found for it in the manufacture of explosives, for the treatment and purification of sewage, as an antiseptic, for the preservation of alterable liquids, &c.

Dealing next with the subject of production, the authors glance at the present sources of supply, and discuss the possibilities of their extension. The production from all sources—*i.e.*, gas and shale works, chemical factories, and carbonizing works—extends at present at the rate of about 8 per cent. annually; but at the vastly increasing rate of consumption, it becomes a question whether this production is sufficient—whether the demand will not overtake the supply. The ammoniacal liquor of gas-works remains the main source of sulphate; and through no other channel can any great increase for the time be expected. That such an increase is possible, the authors consider may be assumed from the laudable endeavours of gas managers to increase the consumption of gas by the adoption of a more liberal policy in the way of supplying service-pipes free, abolishing meter-rents, and selling gas in small quantities. Next in importance as producers of sulphate are the shale-oil works of Scotland; but from these, again, judging from the present condition of trade, no tangible increase need be expected in the near future. In placing some 23,000 tons of sulphate on the market, these works furnish a fair quota towards the total production. Of course, they have many possibilities of being augmented at some future time. The sources of ammonia from iron-smelting furnaces increase but slowly—much slower, indeed, than was at one time anticipated. Still, even an advance of 500 to 1000 tons annually counts for something; and the recent stimulus in the iron trade may rapidly increase the production from this source at an early date. Similar efforts are being made on the Continent, especially in the Westphalia district. Coke and carbonizing works have made little progress in adding to the ammonia supply; but with the enhanced values of tar products, it is quite possible that they will have a larger production to deal with. From chemical and other manufacturers—*i.e.*, such as do not use the raw coal, but convert it into gaseous fuel in some particular forms of coke-ovens and gas-producers—there is a great future of supply.

The condition of things set forth in the preceding paragraph seems to indicate that there is no immediate danger of the present supply of ammonia failing, or even falling off. At the same time, Messrs. Bradbury and Hirsch deem it advisable to devote a portion of their "Review" to a consideration of those factors which may interfere with the main source of supply—viz., gas-works. First of these is the electric light; and, bearing in mind that electric lighting projects are actually being carried out in many districts of the Metropolis, that about 6 per cent. of the lighting of Paris is done by electricity, that most of the large towns in the United Kingdom are proposing to experiment with the light, and that America possesses 5400 electric light stations, the authors consider that this illuminant is a source of future danger to the sulphate industry. They nevertheless admit that the many accidents which have occurred in connection with this system of illumination, especially in America, are calculated to shake confidence in it. But they confess that they cannot get rid of the uncomfortable feeling that the higher prices of coal as an accomplished fact, and higher wages, the result of recent strikes, will eventually make gas dearer in England, and thus favour the chances of the electric light by making the prices of the two illuminants more nearly approximate, as they now are on the Continent. Next in order of the competitors of gas is oil; and the progress this is making is evident to the most casual observer by the number of oil-lamps now to be seen in the shops in some of our large thoroughfares. Water gas the authors notice less as a competitor than as a reducer of the production of ordinary coal gas, and consequently of the supply of sulphate of ammonia; and their views in this regard are not very definitely expressed. However, after carefully considering the position, and the undoubted encroachments of the adversaries of gas lighting, they come to the conclusion that gas consumption has not suffered in the slightest, but that, on the contrary, there is still the usual annual increase, and, therefore, that fears need not be entertained at present about any falling off of ammonia production from this source. In fact, it is not so much a decrease of production they fear as an insufficient increase in the supply to meet the exigencies of extended requirements. How such a large demand is to be met will, they consider, be one of the problems of the future. But present producers can help to solve the difficulty by bestirring themselves in good time; and, by increasing the output, benefit the world as well as themselves.

The review of the market month by month is next given, as follows:—

JANUARY.—The course of the market during January called for but little comment. The changes were trifling; the position was scarcely altered; and no influences became apparent worthy of special notice. The values at the beginning and at the close of the month were almost identical; and the small advance which occurred towards the middle was due rather to the operations of some speculators, and to the necessities of others, than to the urgency of any consumptive demand. The dulness of the market during the last week, and the rather easier figures quoted, were not conducive to any haste on the part of consumers to make their purchases. They felt impelled rather to look on until the latest moment, in the hope of a further decrease in values. It was, however, clear that not alone consumers at home, but Continental buyers as well, were still to a large extent unprovided for, and that with a continuance of mild weather, the requirements for February would be on a large scale. Stocks naturally accumulated a little while sales were so dragging; and an attempt was made by some dealers to create a panic by describing an excessive amount of stocks in Continental warehouses. The prices ranged from £12 5s. to £12 10s. during the first half of the month; during the third week a further advance of 2s. 6d. to 5s. per ton was gained; the market closing, however, somewhat quietly at £12 10s.

FEBRUARY.—Manufacturers may eke out a minim of satisfaction from the course of the market this month, by pointing at the small reduction in values—so disproportionate to the gigantic labours of the "Bear" operators. Nearly all the dealers contributed their mite to the depression—the "Bears" by false reports and by intercepting the orders; the "Bulls" by their persistent inactivity. The market might, in spite of all this, have assumed a different complexion had the weather not favoured the downward tendency equally as much; frost and snow in the principal consuming districts on the Continent checking the demand and retarding the season. That the market, in spite of all these unfavourable circumstances, did not give way much, tended to prove that at the bottom of it the position was not so bad as those who were interested in a fall painted it. It was an undeniable fact that spot parcels were finding ready buyers throughout the whole of the month; indicating that, although very few consumers' orders were visible on the open market, large quantities had been sold by the speculators quietly, and no doubt at the lower rates, long ago, and were being covered on the most favourable terms these operators could get acceded. The question arose whether all requirements of consumers had been filled. The reports generally received had so seldom the semblance even of truth, that with no degree of certainty could the quantities required be ascertained. But, in the ordinary sequence of prospects and possibilities, a fair demand during March was within range; and the production being on the decrease, the latter was not expected to outweigh the requirements. Quotations at the beginning of the month were still £12 7s. 6d. to £12 10s.; but fell to £12 5s. during the first half. The weaker feeling fostered by the "Bears" caused prices to drop to £12 2s. 6d.; and by the end of the month, not more than £12 was obtainable. Sales by tender were apparently responsible for the lowest points touched.

MARCH.—The condition of the market during March remained a puzzling one, in so far as the demand from consumers was exceedingly small, while there was nevertheless a prompt and ready sale of all parcels placed on the market. This state of things corroborated the conclusions drawn during February; and it became evident that the speculators had absorbed the orders to a much greater extent than was believed to be the case—a fact which must have been specially patent to producers, not alone by the frequent and urgent inquiries they received from these operators, but also by the readiness with which the prices asked were paid by the parties in question. Thus while these dealers did all in their power to bring about a depression, by misleading statements about the absence of demand, sulphate ceasing to be used, and buyers' requirements being completed, they all the time were "on pins and needles" to find the sulphate—as quickly as possible, of course, to fill engagements previously entered into on their part. They were successful during the first half of the month in lowering prices a little, because their necessities were not then so urgent; but no sooner had they to make forced purchases, than a rally quickly took place, and £12 2s. 6d. was promptly touched, after prices had run down to about £11 17s. 6d. Towards the close of the month, parcels became perceptibly scarce; and there was every indication of a maintenance of values during April.

APRIL.—Parcels were readily taken up during the whole of this month by dealers whose necessities were large; and although early in the month they attempted a lower level of prices, their designs were frustrated by the firm attitude of makers. To the discomfiture of speculators, some large orders, too, came in from foreign consumers, and the home trade developed fairly; so that a practical denial was given to statements made at the end of March that the season was over. In this way the dealers finally became resigned to the overwhelming force of circumstances, and meekly paid the prices demanded. And as quotations were made at the end of March at £11 15s., while up to £12 was paid, an improvement of 5s. per ton was recorded. What was considered most satisfactory of all was the firm appearance of the sulphate market, with the corresponding depression and decline of nitrate; and a difference of over £2 per ton (in favour of sulphate, of course) between the two fertilizers was established. The market closed somewhat quietly, due to the hesitancy of buyers, who, startled somewhat by the sale of a very large nitrate cargo off coast at 8s. 6d. per cwt., were waiting to see its possible effect upon the sulphate market, although, upon the basis of stocks alone, the two commodities could not possibly challenge comparison. On account of the improved sugar prospects, there was considerable inquiry for future parcels.

MAY.—The market was all through pervaded by a strong feeling in favour of the maintenance of values; and every attempt to induce a reduction in prices was not only futile, but convinced consumers that they need not reckon on low summer prices. It also strengthened, if unwillingly on their part, their ideas. In this way a very large business for prompt, June, as well as July-October delivery was done; buyers paying the full values of the day, even for autumn delivery. This buying was somewhat remarkable, as it was so contrary to the previous year's experience; and it was generally thought that the low prices of nitrate would be a great deterrent to consumers entering into forward engagements. But they apparently began to see that nitrate could no longer influence sulphate during the months of short production of the latter during the summer, and that, in the event of large orders, due to the increased sowings of beet, they might have difficulty in securing supplies. German consumers were the largest operators—French and Spanish buyers taking but little. But Russia—apparently a new customer—took some 500 tons; and as the home trade was good, we entered the summer season practically without any great stock. The business done during the month f.o.b. Hull ranged between £11 17s. 6d. and £12 1s. 3d. per ton. The forward business was principally concluded on the higher basis; and for summer and autumn delivery over £12 was paid in many instances. English manufacturers as a rule, however, refused to commit themselves.

JUNE.—A satisfactory business was transacted early in the month; and the good demand at that time gave hopes of improving prices. This expectation was not realized. The market became particularly quiet during the second half of the month—Continental consumers giving no signs of life; and speculators who had been absorbing some large orders were not loth to represent the market as weaker than it was in reality. Prices, however, did not give way much, which was due to the small production at that time of the year, and the firm attitude of makers. But the scarcity which appeared to exist at the end of May seemed to have disappeared with the reduced demand; and the strength of the market was therefore not so well supported. Buyers showed less inclination to make engagements for future delivery; and they were no doubt moved by the stagnation in nitrate during the greater part of the month. The firmer tone of nitrate at the end of June was ascribed to the again somewhat larger consumption in Europe during the first six months of the year; there being an increase of about 25,000 tons in Continental ports. This was, however, somewhat reduced by the smaller quantity delivered from United Kingdom ports—viz., by about 4000 tons. The quotations which during the earlier part of the month, still stood at £12 to £12 2s. 6d., became considerably easier towards the close; the value being not more than £11 17s. 6d.

JULY.—"The market held its own," was all that could be said in a brief review of the market during July. Two elements were at work; but in neither case was there much progress made. On the one side the holders of large Scotch contracts tried their best to push prices up by artificial means; while, on the other, some speculators for a fall, in conjunction with some of the consumers, were attempting a move in a contrary direction—*i.e.*, endeavouring to counteract an improvement by every means in their power. That there was little fluctuation, seemed to show that the conditions of the position were about equally balanced; and for this reason any marked advance in the near future was not to be expected unless some extraordinary requirements came to the front. Some large Spanish and French orders for

delivery to the end of September were taken about this time, at very low prices; and exporters stated it as their experience that they had never before found so little margin between buying and selling values. The transactions at Hull were very small, more particularly so when compared with Leith business. But, of course, the Scotch oil-works produce and have the same quantity available all the year round; while the production from gas-works is at this time of the year at its lowest ebb. The prices ranged from £11 15s. to £11 18s. 9d., according to make and position.

AUGUST.—Contrary to anticipation, a turn favourable to makers set in this month; the active demand for spot parcels, both from dealers and consumers, and the difficulties of shipment from London in consequence of the strikes, conducing to this movement. It became apparent early in the month that several dealers, calculating upon the low summer prices of the preceding year, had taken large orders for shipment during this month; and disappointed at finding the market so strong, they thought it best to cover in their requirements as early as possible. Their anxious buying gave the first impetus to the market; and the firmness was further developed by the demand from consumers, who, as they became aware of the upward tendency, sent fairly large orders for immediate delivery. This was somewhat unexpected, as it was thought that foreign consumers were well covered for near requirements. Spot parcels soon became scarce; the position becoming aggravated by the outbreak of the London strikes, which made shipment from that port a matter of great difficulty, and threw the weight of the demand upon the country market. No wonder, therefore, that values sensibly improved at the various shipping ports; it becoming eventually evident that some of the speculators would be unable to carry out their contracts. In this way, alike at Leith, at Hull, and at Liverpool, we find quotations at the end of the month considerably enhanced, though the extreme rates asked by makers eventually checked business. For future (October-March) delivery, some contracts were made at full prices (£12); but consumers generally abstained from paying these figures—evidently preferring to take their chance, and believing that there was no necessity for making engagements at these values while nitrate remained at its low level, and shipments and loadings of the latter were on a large scale. The prices ruled during the month at £11 17s. 6d. at the beginning, £12 at the middle, and £12 2s. 6d. to £12 5s. at the end.

SEPTEMBER.—The market during September fluctuated very little; but the general run of prices was barely equal to that of August. Owing to the difficulties which still existed of making shipments from London, country parcels were eagerly sought after during nearly the whole of the month; and as there was no accumulation of stocks, full prices were accorded for such parcels as were available for immediate delivery. As the month progressed, it became plain that many orders had been taken by dealers. And it must be admitted that their purchases principally caused the maintenance of values, for there was a decided falling off in the demand from consumers; the season, especially as far as the northern ports of the Continent were concerned, being almost over. Sulphate, during the last few days of the month, was offering more plentifully—a fact which was eagerly seized upon by the speculators, to the detriment of the market; but while it had to be acknowledged that the production was on the increase, there was, on account of the non-existence of stock in the country, no danger as regards the depreciation of values, so long as makers avoided pressing their parcels unduly upon the market—the manipulation of the stocks, accumulated during the strikes in London, being the only cause of anxiety. The market was quiet at the beginning, at £12 2s. 6d.; it improved a little about the middle; and closed with a steady feeling at £12 2s. 6d. again.

OCTOBER.—The tone of the market during October was steady, though very quiet—a marked contrast to the events of twelve months ago. In October, 1888, prices unexpectedly rose from about £11 10s. to £12. 2s. 6d. —the excitement in nitrate being responsible for this advance. Sulphate maintained its position through the actual demand, which was exceptionally good during the summer, and also appeared to be above the average during the autumn. Arguments were put forth, and dealers and speculators did their best to impress producers generally with the idea that prices must come down in November—setting forth the coming heavy production, and the probability of a slack demand; but we thought that an outlet would be found for all the sulphate produced. The quotations were easier as soon as the month was ushered in (£12 to £11 17s. 6d.); but prices did not fall below £11 17s. 6d., as there was no large quantity pressing on the market, and there were fair requirements.

NOVEMBER.—The course of events during November completely defeated the anticipations of the dealers, and rebutted the confident opinions expressed by many. Of course, it cannot be altogether denied that to some extent extraneous circumstances helped to provoke an improvement; and we may say also frustrated a decline, which dealers and speculators attempted to bring about. But, after all, it is the demand principally which regulates the market; and it showed at no time a serious falling off. The larger requirements in the autumn seem to have not only prevented an accumulation of stocks, but also kept the heavy production moving off. We did not at the time share the views about lower prices; on the contrary, we believed in the maintenance of values—at the same time warning producers that a further rise could only be expected if again some new, but at present improbable, event should cause further excitement. The strength of the sulphate market during the last fortnight of the month was due to an expected advance in nitrate, in consequence of the resolution among producers to reduce the output; but when nitrate became dull after all, sulphate buyers refrained from hurried purchases, in the hope that the feebleness of nitrate would be transmitted to sulphate. This, however, proved not to be the case. Sulphate values were not only well maintained, but the market closed strong at £12 2s. 6d. to £12 5s.; having gradually advanced to this figure from £11 18s. 9d. at the beginning of the month.

DECEMBER.—There was very little change noticeable at the beginning of this month. Continental consumers, finding that the market would not give way, and that the pet theory of values having to come down through the low nitrate prices was considered a vague statement which no longer frightened sulphate producers, abstained from making purchases, in the hope of circumstances favouring a decline in the early part of the new year. It is well known how little their action affected the prices; and it was very promptly demonstrated that the dealers would not, or could not, follow the footsteps of the consumers. The former had evidently engagements to fulfil which could not be postponed; and the large quantities absorbed by them gave the market a very firm tone during nearly the whole of the month. The quotations were £12 3s. 9d. to £12 7s. 6d.

The production of sulphate of ammonia from all sources in the United Kingdom during the year 1889 may be estimated at 132,000 tons, apportioned as follows:—Gas-works, 100,000 tons; iron-works, 6000 tons; shale-works, 23,000 tons; coke-ovens and carbonizing works, 3000 tons.

From the tables which are given at the end of the "Review" we take the following:—

Production, Deliveries, and Exports of Sulphate of Ammonia during the Past Three Years.

	1887. Tons.	1888. Tons.	1889. Tons.
Production—			
England, Scotland, and Ireland, from all sources	113,700	122,800	132,700
Deliveries and Exports—			
Germany, Denmark, Sweden, Russia, &c.	33,000	32,000	32,000
France, Spain, and Italy	21,000	19,000	18,000
Belgium and Holland	16,000	18,000	20,000
America and Colonies	11,500	14,000	17,000
Home consumption, for agricultural and chemical purposes	30,400	31,300	40,000
Stocks	1,800	8,500	5,000
	113,700	122,800	132,000

Comparative Weekly Prices of Sulphate of Ammonia and of Nitrate of Soda during the Year 1889.

Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.
	s. d.	s. d.		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Jan. 5	12 6	11 0	April 6	11 10½	9 6	July 6	11 10	8 7½	Oct. 5	12 0	8 6
„ 12	12 6	11 3	„ 13	11 11	9 7½	„ 13	11 9	8 6	„ 12	11 10½	8 7½
„ 19	12 7	11 3	„ 20	11 11	9 6	„ 20	11 10½	8 4½	„ 19	11 10½	8 6
„ 26	12 6	11 3	„ 27	12 0	9 3	„ 27	11 10½	8 4½	„ 26	11 10½	8 4½
Feb. 2	12 4½	11 3	May 4	11 10½	8 10½	Aug. 3	11 10½	8 4½	Nov. 2	11 11	8 4½
„ 9	12 2	11 0	„ 11	12 0	8 7½	„ 10	11 11	8 6	„ 9	12 0	8 3
„ 16	12 3	11 0	„ 18	11 11	8 6	„ 17	12 0	8 7½	„ 16	12 1	8 4½
„ 23	12 1½	11 0	„ 25	12 0	8 4½	„ 24	12 1½	8 7½	„ 23	12 1½	8 6
March 2	11 11	11 1½	June 1	12 1	8 4½	„ 31	12 3	8 9	„ 30	12 1½	8 9
„ 9	11 10	11 0	„ 8	12 0	8 3	Sept. 7	12 2	8 7½	Dec. 7	12 2	8 6
„ 16	12 0	10 9	„ 15	12 0	8 4½	„ 14	12 1½	8 6	„ 14	12 4	8 4½
„ 23	12 1	10 9	„ 22	11 11	8 4½	„ 21	12 1½	8 6	„ 21	12 4	8 4½
„ 30	11 11	10 6	„ 29	11 10½	8 6	„ 28	12 1½	8 4	„ 28	12 3	8 4½

Average Prices per Ton of Good Grey (24 per Cent.) Sulphate of Ammonia, f.o.b. Hull.

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1880	19 15 0	19 5 0	18 12 6	18 10 0	17 18 0	18 15 0	19 5 0	19 5 0	18 15 0	19 0 0	19 5 0	19 10 0	19 0 0
1881	19 17 0	20 5 0	20 0 0	19 15 0	19 11 3	20 5 0	20 6 3	20 10 0	20 7 6	20 10 0	20 11 3	20 15 0	20 4 6
1882	20 17 6	21 2 6	21 6 3	20 10 0	20 4 3	20 10 6	20 15 0	20 11 3	20 9 6	20 1 3	19 6 9	19 7 6	20 8 6
1883	18 15 0	18 3 9	18 8 0	17 3 9	16 18 3	17 5 6	16 5 0	16 7 0	16 10 0	15 5 8	13 17 0	13 13 0	16 11 0
1884	14 0 6	14 5 0	14 11 6	14 10 6	14 7 6	14 13 9	14 19 0	15 8 6	15 6 3	14 12 6	13 12 0	13 3 1½	14 9 3
1885	12 12 9	12 1 3	11 18 3	11 15 4	11 3 6	11 18 3	11 14 3	11 16 6	11 2 6	10 12 6	10 3 9	10 5 9	11 9 1½
1886	10 14 6	11 5 7½	12 11 11	12 5 0	10 17 0	11 0 7½	11 3 6	11 5 7½	10 18 5	10 13 9	10 11 11	10 15 7½	11 3 7½
1887	11 12 0	11 14 6	12 3 9	11 5 8	11 13 3	12 5 9	12 12 6	12 12 0	11 17 0	11 9 0	11 9 9	11 19 6	11 17 3
1888	12 15 8	12 5 8	12 0 0	11 18 2	11 7 6	11 13 0	11 12 10	11 9 3	11 7 9	11 14 3	12 6 7	12 5 0	11 18 0½
1889	12 10 7½	12 4 9	11 19 0	11 18 9	11 19 1	11 19 6	11 16 7	12 0 9	12 2 10	11 18 9	12 1 0	12 5 4	12 1 4½

Average Prices, 1867–1879.

1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879
£11 10s.	£14 10s.	£15 15s.	£16	£19	£21	£18 3s. 9d.	£17 2s. 6d.	£18 10s.	£18 12s. 6d.	£19 16s. 3d.	£20 5s.	£18 8s. 9d.

Increase in the Price of Gas.—The Corbridge Gas Company have given notice that from the 1st inst., the price of gas will be increased from 3s. 9d. to 4s. 7d. per 1000 cubic feet. The reason advanced for this large addition to the charge is the rise in the price of coal.

The Influenza Epidemic which has been prevalent over the Continent during the past few weeks, and has now made its appearance in the Metropolis, has attacked the *employés* at the Vilette station (the chemical works) of the Paris Gas Company.

THE DANGERS OF ELECTRIC WIRES.

We have from time to time, during the past two months, made reference to the fatalities which have of late been too frequent in America, especially in the chief city, through the use of imperfectly insulated electric wires. Files of New York papers, which have been sent to us by an esteemed correspondent, contain particulars relating to these disasters which it may be of interest, in view of the development of electric lighting in this country, to reproduce.

In the JOURNAL for Oct. 26 last year we gave an account of the shocking death of John E. H. Feeks, a lineman in the employment of the Western Union Telegraph Company, which occurred while he was engaged in removing some "dead" wires at the south-west corner of Chambers and Centre Streets, in New York. The unfortunate man was seen to take hold of a wire by his right hand. Immediately afterwards his legs stiffened, and he fell forward upon two other wires, the current from which literally burnt into his body, and killed him in the presence of hundreds of spectators. Early in the following month another accident of a serious character occurred in Fourth Avenue. A horse, drawing a waggon, stepped upon a charged wire which had been dragged down, and received a shock. The driver of the waggon was thrown into the street, the horse was killed, and one of the policemen who had been called to the scene sustained injuries. The death of Feeks was the subject of a long investigation by the Grand Jury, with the result that, although they were unable to fix the responsibility definitely, they expressed the opinion that the fatality was due to the practice of stringing electric light wires upon the poles used for carrying telephone and telegraph wires. The jury made an important presentment on the general subject of the location of electric wires, in the course of which they stated that, whenever possible, subways should, in their opinion, be constructed, of ample space to allow for the laying therein of gas, steam, and water pipes, as well as for electric wires, instead of allowing each separate company to have the exclusive use of a particular portion of the street. They could not for want of time, go into the whole question of subway legislation; but they had been assured by satisfactory evidence that the opposition of the electric lighting companies to burying their wires had practically ceased, and that they would use the subways when completed. At the same time, it was their opinion that the city authorities should keep constantly in view the fact that ultimately they ought to avail themselves of their right of the city to become the owner of its own electrical subways, and that the control of these subways should be vested in the Department of Public Works, and not in a separate commission irresponsible to any local authority. They thought it was a grave error to entrust so important a matter as this to a body having no practical acquaintance with the subject of electricity; and they expressed the belief that the Board of Electrical Control had been negligent as well as incompetent, and should, as soon as possible without the serious impairment of vested interests, be removed, and the control of the electric subways and service entrusted to a competent supervising authority.

On Nov. 30 a shop assistant named Harris was killed by a shock from an electric current, which he received while engaged in carrying a show-case into a store on the Eighth Avenue. This accident was also made the subject of an official investigation, when the following facts came out:—The exterior of the store was lighted by three Brush lamps, and it was contact between one of these and the metal binding of the case which caused the transmission of the current to Harris's body. The owner of the stores stated that the case had been used by him for four or five years, and had been taken in regularly every night, as Harris was trying to take it in when he was killed. It had always stood under the lamp from the time it was put up, and he had never been informed by the Brush Company or any of its *employés* that there might be danger should the two come in contact with each other. The question then arose as to the height at which the lamps were hung above the pavement; and the result of an examination of one of the experts employed by the Board of Electrical Control showed that the lamp which caused the death was 8 inches lower than the regulations of the Board allowed—viz., 9 feet from the pavement. This witness said the lamp was an exceedingly unsafe one, not only from the fact that it was hung too low, but because the carbon had come through the bottom of the frame, and was wholly exposed for an inch or two. This projecting carbon was practically as dangerous as a naked "live" wire. Another of the rules of the Board required that there should be no such exposed part of a lamp; and had this regulation been obeyed by the Brush Company, Harris never would have been killed. The dangerous condition of the lamp was obvious to any practised eye, and if another rule, requiring an inspection of currents once every hour, had been complied with by the Company, its condition would have been remedied. Harris's fellow-assistant, who helped him with the case and who escaped death only because he stood on the stone pavement instead of the iron grating on which Harris was standing when the case touched the lamp, repeated the story of the accident; and then Dr. W. C. Campbell, who examined Harris's body just after the fatality, was called. He said that the electric current had charred the flesh on the inner surface of the man's left hand, where it had entered the body, and just at the base of the left little toe, where it had passed into the ground. Underneath the latter spot a small iron nail in the sole of Harris's shoe had come through, touching the foot. This nail had made direct contact between Harris's flesh and the iron on which he stood, and formed an excellent outlet for the current. The leather about the nail showed evidence of having been scorched. Dr. T. Killilea, who assisted in the autopsy, corroborated his colleague's testimony; and also gave particulars of an experiment made by himself and an expert electrician, in testing the strength of the current passing over the Brush Company's wires at the spot where Harris was killed. The instruments used recorded a force of 2500 volts. The Lamp Superintendent of the Brush Company was unable to explain why the lamps at the stores in question, as well as those in other parts of the Avenue, had been allowed to hang lower than the regulation distance; all he knew was that this was a fact. In the end, the jury returned a verdict to the effect that Harris's death was the result of an electric shock caused by a Brush lamp; and they censured the Company, whom they considered solely responsible, for not complying with the regulations as to height. They added to their verdict two recommendations—viz., that the Board of Electrical Control and the Board of Health should be requested to use extraordinary and speedy measures to have the wires of all the electric light companies of the city laid underground; and that these Boards should use all necessary care to have the wires and lamps of all the electric light companies properly insulated. It appears that the Company were aware, for some days prior to the accident, that there was a leakage in the circuit, and thought it was in a subway; and the fact of their not taking prompt steps to locate it, certainly seems to lay them open to a charge of culpable negligence. In fact, this view has been taken by the Grand Jury, who, we learn, have found a true bill for manslaughter against the Superintendent of the Brush Company.

A similar accident to that which befell Feeks happened to another lineman named Claussen on the afternoon of the 9th ult.; the unfortunate man being killed by a shock from an electric wire while at work on a pole at the corner of a street leading out of the Third Avenue. The wires in this case were those of the North New York Lighting Company, in whose service Claussen was; and the fatality occurred while he was engaged in putting up a new glass insulator. There were two cross-arms on the pole. Claussen climbed up, picked his way cautiously through the ten wires which were strung thereon, and threw his right leg over the upper cross-arm. Leaning over, he began to work on a wire which was below him. He was seen to cut a wire, reach for the new insulator, and then fall forward and drop his head, his chin resting on a wire. His arms and head hung straight down. The wrist of his right hand rested on an electric light wire; and from the flesh and his red shirt there arose a thin line of white smoke. According to the graphic descriptions of the scene which were given by the American reporters, the man was actually burning in the sight of a crowd of spectators. After hanging in the wires for about 25 minutes, Claussen's body was rescued, and brought to the ground. An examination by a medical man revealed marks of two burns—one on the forward part of the right wrist, and the other a long scar under the chin. A portion of the shirt had also been burnt away. The doctor's supposition was that, in shifting his position, Claussen must have thrown his wrist against a heavily charged wire, the current from which passed through his body, causing instantaneous death. A short piece of the wire, which was cut away, was taken to the station-house. It was said to be covered with what is known as "underwriters' insulation," which was condemned about a year ago by the Fire Department of New York; and on the conclusion of the inquest on Feeks the removal of all insulation of this character was ordered. The wire was bare in several places. The Board of Electrical Control sent an inspector to the scene of the fatality. After a thorough investigation, he reported that the pole belonged to the Western Union Telegraph Company, and was in bad condition; and that uninsulated telegraph wires and electric lighting wires were strung side by side. The electric wire so strung was in bad condition, and placing it between the telegraph wires seemed criminally careless. The inspector further said that the wires of the Electric Lighting Company along their whole line were in a dangerous condition. The other wires were poorly insulated at the cross-arm—being bare in places; thereby making it possible for a grounding at the point where Claussen met his death. The Board were of opinion that if some regulation were framed forbidding the use of a current of more than 300 volts, all danger would be avoided. This fatality, like that which befell Feeks, was the subject of a long investigation by the Grand Jury. One of the principal witnesses was Mr. S. S. Wheeler, the Board's Electrician. He thought that if the rules of the Board were observed by the various companies, these accidents would not occur. This suggestion, however, did not strike the Grand Jury with much force, as they had already found that four public bodies, in one way or another, controlled the electric wires, and that no actual responsibility could be fixed upon any one of them. The inquiry was extended so as to comprise the entire question of the dangers of electric lighting wires; and the conclusion come to was that the business of the generation and distribution of electricity should be thoroughly investigated by the State, with a view to decisive legislative action being taken.

A curious accident, fortunately unattended by very serious results, occurred on the Third Avenue on the 11th ult. At the north-west corner of this thoroughfare the Harlem Electric Light Company had a lamp, suspended from which were two wires running diagonally across the street. Along the Avenue subways were being constructed; and, owing to insufficient support, or the loose condition of the earth consequent upon excessive rains, the lamp-post had fallen over, bringing down with it the electric wires. This must have happened early in the morning; for at half-past six o'clock the driver of a car passing along the roadway just about daybreak ran into the wires, and snapped them like cords. As they parted, a current passed through the brake, and attacked the driver in the knee; giving him a shock that severely burned the flesh, and threw him off the car into the street. He was conveyed to the hospital, where an examination revealed the fact that the leg that had been touched by the wire was bent at the knee, and quite stiff. Nobody dared to interfere with the broken wires; but the Company were apprised of the accident, and repaired the damage. On the evening of the same day, some alarm was caused at the corner of Sixth Avenue and Fourteenth Street by the appearance of a green flame emitted from an electric light wire hanging from the elevated railroad structure there. The point of ignition was immediately under an iron cross-arm of the Sixth Avenue elevated road. At the first flash of the wire a cry went up from the passers-by; and soon the sidewalks and the roadway were blocked by an excited crowd. It appears that the insulating material had been worn away by the friction of the wire against the cross-arm, owing to the vibration caused by the trains; the result being that the copper became exposed, and eventually started into a blaze.

A singular fatality occurred in the works of the Manhatten Electric Light Company, on the 14th ult. Patrick Sullivan, a fireman in the Company's service, was killed by an electric shock received from an incandescent lamp which he was carrying. As he was alone at the time, no precise details of his death will ever be available. The *employés* in the Company's works stated that the current which fed the

lamp was only 120 volts; and as such a current has never been deemed dangerous, it is difficult to determine how the unfortunate man received the fatal shock. Sullivan was in a dark cellar beneath the engine-room, in which were several coils of steam-pipes, and his lamp was fed by a double flexible wire connected to the dynamo. At the time of the fatal occurrence there was only one of the engines running. This was a 600-horse power engine, capable of supplying 6000 lamps. Over the engine was a horizontal wooden bar holding six incandescent lamps. The wire connected with Sullivan's lamp ran from this board. The lamp was found smashed to pieces on the floor of the cellar. The wire was broken near the brass shank of the lamp; and the insulation was abraded, leaving the wire bare. There were marks of blood on the metal shank of the lamp and on the wire connected with it. It is supposed that Sullivan, while handling one of the metal valves on the steam-pipes with his right hand, and holding the lamp in his left hand, unfortunately completed the circuit with his body, and received the shock which caused his death. This case demonstrates the danger lurking in what are regarded as the safest kinds of electric lighting appliances.

All these casualties pointed to the necessity for the adoption of some precautionary measures; and, accordingly, Mr. Harold P. Brown, whose name is well known in connection with his published statistics of disasters caused by electric lighting wires, applied, in conjunction with two other gentlemen, to the Supreme Court for an order, requiring the Board of Health to show cause why a *mandamus* should not be issued compelling them to abate the nuisance of high-pressure currents on electric light wires. Mr. Brown set forth in his affidavit that all wires carrying high-pressure currents are dangerous to life, whether above or below ground; that no matter how well insulated a wire may be, it is subject to leakage if it carries a high-pressure current. He said further that he had ascertained by actual tests that the leakage of wires under such circumstances averages 45 per cent.; and in some cases rises as high as 60 per cent. Thus a wire carrying 1000 volts leaks 600 volts; and any person coming in contact with this leakage would be instantly killed, even though the wire were laid in a subway. He cited the death of Harris as an exemplification of this fact; the leakage in that case being from a buried wire at some distance from its victim. Mr. Brown's opinion is that the high-pressure current is not necessary to the maintenance of electric lights, but is only used to save the consumption of copper. The result of these and other proceedings, it may be remembered, was an order by the Supreme Court for the removal of all dangerous overhead wires from the streets of New York, and the laying of them in subways. This, however, does not seem to have secured immunity from accidents; for not many days since it was reported that, without the slightest warning, "a considerable length of pavement, amounting to several tons in weight, rose many feet in the air, amid a geyser of flame. Many pedestrians had their clothes and their persons injured by the subsequent fall of the *débris*." The explanation given of the occurrence is that a leakage of gas was exploded by a spark from one of the underground wires. It does not even appear that the gas-mains and the wires were carried along in the same subway, but that the gas had leaked in from a defective pipe. The very latest disasters in connection with electric lighting in America of which particulars have reached this country occurred last week, and are noticed in our "Electric Lighting Memoranda" to-day.

Turning from New York to Boston, we find that the terrible fire which broke out in that city on Nov. 28 last, causing damage to the amount of $5,000,000, and the death of two firemen, was, as reported at the time, caused by the electric current from a light or power main entering the building where the fire broke out, by the small wires of the Boston Electrical Time Company's circuit; thereby starting the conflagration in one of their wooden clock-cases. There can be no doubt that the present arrangement of wires for electrical purposes must be always a source of possible danger from fire. Mr. S. E. Barton, one of the Boston Fire Insurance experts, thinks that the only means of preventing the risk would consist in having fusible cut-outs put on every circuit, no matter whether or not they are constructed to carry powerful currents.

The foregoing particulars may be appropriately closed by some statistics, obtained from official records, recently furnished by the New York correspondent of the *Daily News*, as to the number of persons killed by electric lighting wires in America since 1880. He says that previous to that date the arc light circuits with continuous current were much used; but during five years no deaths were caused. Between 1880 and 1887 pulsating and high-tension currents came into use for the arc lights; and in that period 72 deaths took place, of which 62 were traced to the pulsating currents. During the past two years the alternating high-tension current has been much in use, and by it 44 persons have been killed; making the total number of deaths in various parts of the country during the nine years 116. In New York City, 25 persons have been killed within two years, nearly all by the alternating currents. The list does not give all the deaths, but only those officially reported with names and particulars. It is estimated by experts that there have been fully 200 deaths in various parts of the country since 1880.

Although in England we have fortunately not had many serious catastrophes resulting from installations of electric lighting, we have not been free from accidents, and the occurrence of one only yesterday week should serve to remind those who are captivated by the new system of illumination of the dangers which attend its adoption. On the evening of the above-named day, the residence of Mr. W. A. T. Amherst, M.P., at No. 8, Grosvenor Square, was the scene of an alarming fire. It was discovered that the back part of the second floor had become ignited, and the flames were rapidly involving the rest of that floor and the rooms on the third floor when water was brought into play. For a short time it seemed certain that the entire house, of 20 rooms, would be destroyed; but happily the outbreak was brought under control in the course of an hour, and soon afterwards completely extinguished. The back part of the second floor had then been completely burned out, while very serious damage had been caused to other back parts of the house. The cause of the fire was ascertained to be the overheating of an electric wire. As the house is situated in the district of the St. James's and Pall Mall Electric Lighting Company, who supply a low-tension current, the Secretary of that Company at once wrote to the papers to point out that if, as reported, the fire was caused by an overheated wire, it must have been one connected with a high-tension system. This turned out to be the case. The premises have since been examined by Mr. Musgrave Heaphy, C.E., who has reported that he found the wiring of the house certainly not in accordance with any fire insurance rules with which he was acquainted, nor with the specification of the London Electric Supply Corporation. The conductors were in contact under the floors, and were uncased and fastened by metal staples. Among the few places that he was able to examine, he found that a staple had cut into the insulation. The conductors in another place were actually in contact with the bell wires. The Manager and Secretary of the above-named Corporation (Mr. C. B. Waller), who furnished the supply, has likewise written to the papers to say that had his Company known the facts as now placed before them by Mr. Heaphy, they would never have connected the Grosvenor Square installation to their mains, as, with work done in the way reported, a fire, sooner or later, was inevitable, whether the system of supply was a high or a low tension one.

On the Continent the dangers incidental to electric lighting have lately forced themselves upon public notice. The Czar of Russia is at present suffering from illness which is stated to have been aggravated by the sudden extinction of the electric light in the Gatschina palace. Not long ago the horses at one point on the Paris Boulevards were "shocked" by the current used for the public lighting; and only last Wednesday, according to the *Gaulois*, the Théâtre Français had a narrow escape from fire caused by the overheating of electric wires. While the performance was going on, smoke was seen to be rising from the footlights. The iron curtain was immediately lowered, and the cause of the smoke ascertained. Fortunately the audience remained quiet, and the performance was resumed after a few minutes interval.

All these incidents point to the necessity for the exercise of great care in the installation of electric lighting, especially in view of the statement which has been made that the best system of insulating the wires is far from being infallible.

DONCASTER CORPORATION GAS AND WATER SUPPLY.

Increase in the Salary of the Gas Manager—The Minerals under the Water Reservoir.

At a Special Meeting of the Doncaster Town Council last Wednesday, a recommendation to advance the salary of the Gas Manager (Mr. R. Bridge) by £50 a year was brought forward. Mr. Abbott proposed an amendment rejecting the recommendation. In seconding this, Mr. Armitage said his opinion was that the payment was already excessive. At Rotherham, the Gas Manager was paid only £200 a year, and the income from the gas undertaking was about £20,000; while at Doncaster it was about £15,000. The remuneration of the Manager would be equivalent to £7 a week. Alderman Wainwright advocated the increase proposed, and said the Corporation had an exceptionally competent Manager. Other members also spoke in support of, and in opposition to the proposed advance; and in the end, seven votes were recorded in favour of the amendment, and twelve against it. Later on in the proceedings, a discussion arose concerning certain statements which had been made to the effect that the Gas Manager was exceeding his duties by supplying goods to tradesmen. It was explained that this had been referred to in Committee, and that a resolution of confidence in the Manager had been passed unanimously. He had challenged anyone to prove that he had put any profit in his own pocket; but that with whatever he had accommodated persons, he had handed over the proceeds to the Corporation. The minutes of the Water Committee presented at the same meeting briefly intimated that notice had been received from Messrs. J. and J. Charlesworth, Limited, of the Thrybergh Hall Colliery, in regard to the minerals under the water reservoir, and that Mr. Rhodes and Messrs. J. and P. Higson, mining engineers, and Mr. B. S. Brundell, C.E., had been appointed to make a report with reference thereto. Alderman Smith, the Chairman of the Committee, said at present there was nothing further to remark beyond what was recorded in the minutes. They would have a report officially shortly, and they had been told that in the meanwhile there was no cause for any uneasiness.

ROCHDALE CORPORATION GAS AND WATER SUPPLY.

The Past Year's Record.

In accordance with their usual custom, the *Rochdale Observer* has published a review of the local events of the past year; and as far as the Corporation Gas and Water Departments are concerned, the statement is a very satisfactory one. Improved trade and diminished prices have caused a considerable increase in the consumption of gas during the year. Up to the 27th ult., the total output since January was about 230,500,000 cubic feet, or nearly 11,000,000 feet in excess of the total for the same period of last year. The demand has been especially pressing during the dark days of the past month. The last week beat the record both for make and consumption. The quantity manufactured was 12,902,000 cubic feet, and 12,964,000 feet were sent out; this being nearly 1,500,000 feet in excess of the quantity for the corresponding week of last year. The experience of the past few weeks seems to show that at no very distant date, if the consumption goes on increasing, there will have to be an extension of plant. On Monday, the 16th ult., 2,242,000 feet were sent out; this being in excess of the utmost quantity which could be produced with the whole carbonizing plant in operation. The total quantity that the holders can store is 1,850,000 feet; and during the past few weeks nearly 2,000,000 feet per day have been sent out. Two reductions were made during the year in the price of gas—in April one of 3d. per 1000 cubic feet for consumers outside the borough; and in July, a reduction to 2s. per 1000 feet for purposes other than lighting within the borough. The past year was a good one for the sale of residual products. There was no material advance in the price of sulphate; but for tar products the quotations went up, especially for pitch. The new plant erected in this department at the latter end of 1888 has given satisfaction; and so have the two new Perrett's furnaces put in during the summer to burn the refuse from the retort furnaces. Our contemporary regards as the most important event of the year in connection with this department the increase of wages to all *employés*, which was sanctioned at the December meeting

of the Council. The wages bill last year was about £9000; and the advances allowed, together with the shortening of hours, represents a difference of upwards of £1500, or about 17 per cent. The principal feature in connection with the Water Department is the great improvement in its financial condition. For the year ending March, 1884, the deficiency was £16,072; in the succeeding year it was £16,020; while for the year ending last March, it had sunk to £12,700. The demand on the rates was for £12,000; and although this did not meet the actual deficiency, the progress made during the year was such that our contemporary thinks it is not at all likely the demand will be increased next year.

FRANKFORT CORPORATION WATER SUPPLY.

From some particulars which recently appeared in the *Builder* we learn that during the last ten years the Corporation of Frankfort have expended a large sum of money upon the improvement of the water supply of the city. Up to the year 1878 the service was exceedingly bad and insufficient—the water being mostly drawn from wells; but in that year the water-works at Vogelsberg and Spessart, situated in the mountains some 50 miles from the town, were completed at a cost of £502,000. The water is obtained by natural pressure from the sandstone and basalt rocks; that in the former aqueduct being at 13·3, and that in the latter at 12 atmospheres. These works are capable of supplying about 3,000,000 gallons of water per day. The water is passed through concrete aqueducts and iron mains to two iron reservoirs near the town; one being capable of holding 4,200,000 and the other 3,000,000 gallons. This is ample for the supply of the town for 24 hours. During the past few years, however (the number of inhabitants having increased from 100,000 to 150,000), this supply has been found insufficient, particularly in the summer; and it was, therefore, first decided to enlarge the works at Spessart at a cost of £115,000. However, some borings having been effected by the authorities in a wood some three miles from the town, an excellent supply of water was obtained from a stratum of gravel and sand at a depth of from 30 to 50 feet. In consequence, it was decided to increase the supply from this source. The water is obtained through the medium of a number of copper tubes sunk to a depth of 40 feet. They are 2 inches in diameter, closed at the bottom, perforated, and bound with copper wire to prevent sand entering; and through these the water percolates into a main running horizontally, whence it is pumped into a reservoir. It might be supposed that these small tubes would hardly furnish the required supply; but they yield, in fact, as much as 800,000 gallons per day. The whole installation has cost £45,000. A pumping-station has also been erected close to the River Main, at a cost of £4000, whence river water is pumped to the slaughter-houses, markets, fountains, sewers, &c. The continuous supply of the city now amounts to nearly 5,000,000 gallons of water per diem. As an example of the benefit derived from these improvements, it may be mentioned that the mortality from typhoid fever and kindred diseases in the town has fallen from 8 per 10,000 inhabitants in 1870 to 51·1 at the present time.

THE SHEFFIELD CORPORATION WATER COMMITTEE AND LEAD POISONING.

It will be remembered that at a recent meeting of the Water Committee of the Sheffield Corporation, it was decided to request the General Manager (Mr. E. M. Eaton) to report "on the effect the Sheffield water had on lead at the present time, and as to the best means of treating the water, with the view of counteracting any such effect it might have." At the meeting of the Committee last Wednesday, Mr. Eaton presented a very lengthy report, in which he showed that, ever since the water-works came into the hands of the Corporation, he had been experimenting upon the lines of suggestions made by various chemists and others; and he had come to the conclusion that the only effectual remedy for preventing the water taking up lead, was that which the old Water Company proposed when they went to Parliament two years ago. Their scheme was to construct filter-beds of flint and limestone; and such beds he still regarded as the most direct and effective remedy. The cost of this work for the Redmires reservoirs alone (which in his opinion were the only reservoirs at which such works are necessary) would be about £20,000. To maintain the filter-beds in a state of efficiency would involve an expenditure of about £350 per annum. Before, however, advising the Corporation to commit itself to so expensive a scheme, he desired to still further investigate the matter, and to consult upon it with an eminent London chemist and with Mr. Thomas Hawksley, the Consulting Engineer to the Committee. The professional chemist will be named at the next meeting; but he will not be one of those who gave evidence either for or against the Corporation when before Parliament. It was also mentioned that the condition of affairs in regard to the quality of the water and everything connected with the conveyance of it into the town, is precisely the same as it was 50 years ago, when the Redmires reservoirs were constructed. The popular theory with regard to how the water becomes liable to absorb the lead was, in his opinion, altogether erroneous. Experiments had proved that the water was much more dangerous after a thaw, when that thaw was succeeded by heavy rains. The reason why the water from the Bradfield reservoirs was not so liable to absorb lead as that from Redmires, was that it had to travel a much longer distance; and in its course was joined by water from streams and springs, which had the effect of neutralizing whatever lead absorbing element there might be in the water from the reservoirs. The Committee approved of Mr. Eaton's suggestion as to pursuing his inquiries and investigations. The members also had before them at the meeting some glass-lined pipes, the invention of Mr. J. P. Donovan; and they have intimated that they will be glad to authorize the use of glass-lined tubes as fittings by any consumer who might desire their use. Beyond this, the Committee felt they had no power to go.

Intended Resignation of the Manager of the Colne Gas-Works.—Mr. T. Varley, Manager of the Colne Local Board Gas-Works, has intimated to the General Purposes Committee of the Board his intention to retire next June, by which time he will have been in the service of the Board 28 years.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

A very short meeting, in which everything was disposed of without remark, was held by the Edinburgh and Leith Gas Commissioners on Monday. The most important items of business were the Engineers' reports, which showed that the output of gas from the Edinburgh works during November was 105,215,000 cubic feet, or a decrease of 847,000 cubic feet as compared with the output in November, 1888; and that from the Leith works there was an output of 52,073,000 cubic feet, or an increase of 2,883,000 cubic feet. The quality of the gas in Edinburgh was 28·70 candles; and in Leith, 28·76 candles. There was also the report of the Treasurer for the month of November, which stated that the amount collected was £28,340 6s. 5d., which, allowing for meter-rents now abolished, represented an increase over the corresponding period of last year to the extent of £772. It will be observed that there is a decrease in the output from the Edinburgh works. This is accounted for by the disorganized state of the works, consequent upon the re-building of one of the retort-benches.

The city accounts of Aberdeen are made up to the end of each year. There are, of course, several items in them which are of interest to your readers. For instance, it is shown that the water assessment produced £16,524, as against £16,731 the previous year; and that the total revenue in the Gas Department was £61,422, and the expenditure £52,744, leaving a surplus of nearly £9000. There is a total indebtedness upon the water-works of £213,992; and upon the gas-works of £205,808.

Mr. James Leslie, C.E., who has been a well-known figure in the Scotch engineering world for the last 50 years, died in Edinburgh on Sunday. It is remarkable, in looking back, to see the extraordinary number of important engineering works in this part of the country, with which he was connected. In his youth also he served his time in London, and was employed on London Bridge, and upon the Liverpool and Manchester Railway. On settling in Scotland he superintended the carrying out of harbour extensions at Leith, Kirkcaldy, Arbroath, and Montrose. His first permanent public appointment was that of Resident Engineer for the Dundee harbour works, which he obtained in 1832 unsolicited. He resided for 14 years in Dundee; and during that time planned and superintended the construction of the works for bringing a supply of water from Monikie. In 1846 he came to Edinburgh to be Engineer to the Edinburgh Water Company. He extended the Pentland water-works by the construction of six reservoirs, and the enlargement of the original reservoir at Glencorse. He was the chief adviser of the Edinburgh Water Company during the controversy in 1869-73 which ended in the taking over by the Corporation of the water supply, the rejection of the St. Mary's Loch scheme, and the adoption of the Moorfoot scheme. Mr. Leslie, in fact, along with Mr. Hawksley, was responsible for the adoption of the Moorfoot scheme, which, after about 12 years, the Trustees find it necessary to supplement. Mr. Leslie was Engineer of the first Lintrathen scheme of the Dundee water supply. He engineered the Paisley Water-Works. It was upon his report that the harbours of Burntisland and Granton were built, which enabled a line of ferry-boats to be run between Midlothian and Fifeshire; but which, in another couple of months, will be almost entirely superseded by the Forth Bridge. Mr. Leslie's work was characterized by its substantial nature. Distribution-pipes which he put down in Edinburgh when he first came here, have given almost no trouble, and when any of them are lifted, they are found to be in the best condition. Since 1870 his son Mr. A. Leslie, and latterly his son-in-law Mr. R. C. Reid, have been associated with him as Engineers to the Edinburgh Water Trust. He was 88 years of age. Mr. Leslie's removal leaves a blank in the Scotch engineering world which there is no one to fill as he did.

The Edinburgh Water Trust have closed a very satisfactory year. Their delivery in the City has been mostly above 40 gallons per day per head of the population, a supply which should certainly be abundant for all purposes. The year closes too with the water rising in the reservoirs. This is the more gratifying when it is remembered that 1889 leant, if anything to the dry side. The rainfall, as measured on the two collecting areas of the Trust, shows the following:—At Glencore in 1889, 35·05 inches; in 1888, 43·36 inches; and in 1887, 34·812 inches. At Gladhouse in 1889, 32·24 inches; in 1888, 35·19 inches; and in 1887, 30·86 inches. It will thus be seen that in each of these years the rainfall upon the old gathering ground on the Pentland hills was heavier than on the new ground which is included in the Moorfoot scheme. The explanation of this is probably that the Pentlands, being nearer the sea, exhausts the water-laden atmosphere before it reaches the Moorfoots.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

It seems that there has also of late been a very big demand made upon the producing powers of the works belonging to the Partick, Hillhead, and Maryhill Gas Company. But this, of course, must naturally be expected, seeing that the Company's area of supply consists almost entirely of burghal and non-burghal districts, which are comprised in the suburbs of Glasgow. During the 24 hours constituting the last day of the year just departed, the amount of gas sent out from the Company's works was the biggest ever recorded for a similar period—being 1,752,072 cubic feet; and the quantity of gas passed into the holders during the same period was 1,636,400 feet. There were still 84 retorts in reserve and ready to be "fired up" on the shortest notice. Some three years ago or thereby the make and consumption of gas for a 24-hours' period had never exceeded 1,123,000 cubic feet. At the time there was some disposition shown to give up the concern as being a hopeless muddle, and on the plea that it was impossible to work it any longer at a profit to the shareholders. Within that period, however, a very marked change has been brought about in the actual condition of things, as an amount of extra manufacturing power has been created such as had never previously been contemplated.

The question of the incidence of local taxation came up this day week at the half-yearly meeting of the Kilmalcolm Parochial Board; the case under consideration being that of the local Gas Company.

The Inspector read a letter from Mr. John Anderson, on behalf of the Kilmalcolm Gas Company, appealing against the amount of assessment for the poor levied in that Company. Mr. Anderson, who was present as one of the members of the Board, said that he had taken the precaution to make inquiries elsewhere; and in answer to the Chairman as to getting reductions, he stated that the Company got 10 per cent., whereas owners of houses got 15 per cent., the water-works 20 per cent., and railways 32 per cent. When these reductions were arranged, the gas-works in Kilmalcolm had not come into existence; and hitherto the Directors had just paid the ordinary rates which the Board had imposed. He thought that, as in the case of the railways and water-works, a larger reduction should be allowed on the gas-works than was granted. The Chairman admitted that on the face of it, it seemed but justice to treat the gas-works as a public work; and on that footing a reduction should be granted. But the amount of the reduction required consideration. Mr. M'Nab failed to see that there was any similarity at all as to the water-works and the gas-works. The former were the property of the ratepayers, while the latter belonged to a private company; and he thought that it should rest with the ratepayers to say that the water-works should be assessed at so much and the gas-works at so much. Charity began at home; and the ratepayers were quite entitled to do as they thought proper. At the close of the discussion, a motion was submitted by Mr. W. G. Stewart to the effect that it be remitted to the Committee to inquire into the matter, and bring up a report at the next half-yearly meeting, the rates for this year to be paid as assessed. This having been seconded, Mr. Woodrow moved as an amendment that a reduction of 20 per cent., the same as that on the water-works, be granted. The Rev. Mr. Murray seconded the amendment, on the understanding that the reduction was for this year only, and that it was not to be regarded as a precedent. On a division being taken, five voted for the motion and five for the amendment. The Chairman gave his casting vote in favour of the motion, which he declared carried.

I am told that the Glasgow Corporation Gas Committee have closed contracts for the erection of stables and limekilns at the Tradeston Gas-Works at a cost of something like £7000.

In connection with the diversion of some of the Glasgow gas-mains consequent on the construction of the Glasgow Central Railway, to which matter I directed attention in last week's "Notes," I may here mention that one of the stretches of diversion likely to be undertaken by Mr. Foulis is the case of a main 4 feet in diameter and some 700 yards or so in length. That will be one of the heaviest bits of work. This particular main is the one which emerges from the gas-works at Dawsholm, and carries the whole of the gas which is sent into the city from that station. The other mains range, I believe, from 36 inches down to 18 inches in diameter.

When the Glasgow pig iron market was opened yesterday after the New Year's Day holidays, there was again considerable excitement on, there being quite a "boom" in prices. The orders for the London warrant market were extensive, and makers were reported to have advanced the prices of some of the special brands, of which the stocks were nearly exhausted. A very large amount of business was done. Prices ran up to 65s. 5½d. per ton cash buyers for Scotch warrants, the closing price for Cleveland iron being 64s. 10½d., while hematite iron closed at 80s. 6d. per ton. There are now 87 blast-furnaces in actual operation, as compared with 73 at this time last year. Stocks are still decreasing at a rapid rate.

Nothing new of any consequence has transpired during the week in connection with the local coal trade—this being holiday time. There is certainly an active demand, and the stocks to meet it are exceedingly limited, so that the miners have the ball very much at their feet. It is thought that there will be a further advance of wages to the miners very soon.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 4.

Sulphate of Ammonia.—The market continues extremely quiet; and, the demand from all quarters being so small, reduced prices had to be accepted to tempt buyers to operate. It is perhaps a significant feature that all dealers and speculators are throwing cold water upon the position, no doubt with a desire to bring prices down to a level suitable to their purposes. More inquiry seems to be springing up at the close; but it is reported meanwhile that £12 2s. 6d. has been accepted at Hull for Jan.-Feb. delivery. Nitrate is very dull, in view of the more unfavourable position for spring delivery.

LONDON, *Jan.* 4.

Tar Products.—Notwithstanding the holidays, a very large trade has been going on during the past week. Important sales of pitch have been made for an entirely new use; and it looks as though this product will not only maintain its present increased value, but that the spring will bring still higher prices. Benzols are dull; and the prices quoted below would be difficult to realize to-day. The demand for solvent naphtha continues unabated; and this product is quoted much higher. A large business is being done in carbolic acid; but prices have got into the rut, and it is difficult to lift them, although the demand would warrant better value. Prices: Tar, 25s. to 30s. per ton, according to position. Benzol, 90 per cent., 3s. 4d. per gallon; 50 per cent., 2s. 6d. per gallon. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 10½d. per gallon. Pitch, 30s. to 35s. per ton, according to position. Crude naphtha, 1s. 3d. per gallon. Light oil, 4½d. per gallon. Lucigen creosote, 3d. per gallon. Ordinary creosote, 2½d. per gallon. Carbolic acid, 3s. 2d. per gallon. Cresylic acid, 10d. per gallon. Anthracene, nominal (30 per cent.), "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—The attempt to depress sulphate has signally failed; and as buyers could not hold off any longer, large sales have been made during the past few days, at prices varying from £12 3s. 9d. to £12 7s. 6d. Stocks are remarkably low, having regard to the time of the year. This market is sure to see better prices within the next month. Other ammonia products continue without fluctuation. The demand for liquid, however, is dull.

The Dewsbury and Heckmondwike Water Bill.—Last Friday a conference took place at Dewsbury between a Sub-Committee of the Heckmondwike Board of Health and of the Dewsbury Town Council, relative to the Bill which the Water Board are promoting in Parliament for extending the time for constructing reservoirs, &c. The Board of Health desire to have more control over the undertaking than they have hitherto possessed, and had sent in certain proposals. These were discussed; but the Dewsbury representatives did not approve of them, and the conference ended—the Heckmondwike delegates declaring that they would individually oppose the Bill.

Norwich Water Company.—The report presented by the Directors of this Company at the last half-yearly general meeting showed that, after paying working expenses, &c., there was a sum, with the balance brought forward, sufficient to pay a dividend on the ordinary shares at the rate of £5 15s. per cent. per annum (less income-tax); leaving £1003 14s. 11d. to be carried to the credit of the next account. A dividend at this rate was accordingly declared. The Chairman and Directors were thanked for their services, and their constant attention to the interests of the undertaking; as was also the Engineer and Manager (Mr. J. Ayris), for the zeal and energy he has displayed in the management of the Company's business.

The Proposed Extension of the Sheffield Gas-Works.—The Sheffield United Gaslight Company are likely to experience some trouble from the owners and occupiers of property in the neighbourhood of the Neepsend Gas-Works in connection with their proposal to make certain extensions at that station, and to carry out which they have applied for authority to the Board of Trade. A public meeting was held yesterday week, at which the objections of the owners and occupiers were stated; the principal one being to the erection of plant for the working up of the residual products. One gentleman recalled the experience of a few years ago, when the Gas Company commenced this work before. Fumes, he asserted, were sent into the air at night, which nearly suffocated them in their beds, their gardens were ruined, and even linen hung out to dry had holes burnt in it. It was agreed to appoint a Committee to make enquiries, and communicate with the Town Council on the subject.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 15.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	108—110*	+½	4 10 11
100,000	20	28 Nov.	8	Bahia, Limited	20	20—21	..	7 12 4
200,000	5	14 Nov.	7½	Bombay, Limited	5	6½—7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4½—5½	..	5 17 10
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	158—163	..	5 13 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British.	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13—14	..	7 2 10
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107–110*	+3	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13¾	Commercial, Old Stock	100	242—247	..	5 11 4
130,000	,,	,,	10¾	Do. New do.	100	195—200	..	5 7 6
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117–122*	+½	3 13 9
557,320	20	12 Dec.	13	Continental Union, Limited	20	47—48	..	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	32—34	..	5 6 7
200,000	20	,,	10	Do. 7 p. c. Pref.	20	36—38	..	5 5 3
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	22—24	..	5 8 4
120,000	10	,,	13	Do. New	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	11—12	..	5 8 4
5,470,040	Stck.	14 Aug.	13¾	Gaslight & Coke, A, Ordinary	100	245—250	..	5 10 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	248—253	–2	3 19 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	157—162	..	4 6 5
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	–1	3 19 4
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	121—125	..	3 12 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	213—218	..	5 10 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	28 Nov.	6	Monte Video, Limited.	20	18½—19½	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8½—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5½—6¼	..	5 12 0
166,870	10	26 July	4	Pará Limited.	10	3⅜—4⅜	..	8 17 9
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14½—15½	..	6 9 2
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	305—305	..	5 6 6
1,350,000	,,	,,	12½	Do. B do.	100	228—233	–1	5 4 1
141,500	,,	,,	13½	Do. C do.	100	240—230	..	5 6 0
600,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	135–140*	..	3 11 5
60,000	5	12 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260–265*	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—215	..	3 9 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143–148*	+3	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	125—130	..	3 9 3
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	251–256*	..	3 14 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197–202*	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	124—126	+4	3 2 6
500,000	100	14 Aug.	12½	New River, New Shares	100	364—369	..	3 5 8
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	128—131	+1	3 1 0
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	167—172	..	3 9 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	163—168	..	3 11 5
1,155,066	Stck.	12 Dec.	10	West Middlesex.	100	260—265	..	3 15 6

*Ex div.

Suggested Abolition of Meter-Rents at St. Helens.—At the monthly meeting of the St. Helens Town Council, held last Wednesday, Alderman Harrison suggested, during the discussion of the minutes of the Gas Committee, that the meter-rents should be either materially reduced or abolished, and gave an instance where a consumer had only burned gas to the amount of 10d. during a quarter, and had been charged 9d. for meter-rent. Alderman Cook said the rents could not be abolished unless the price of gas was advanced, and that was not desirable.

The Rating of the New Southampton Water-Works.—An appeal of the Southampton Corporation against the amount of the assessment put upon the water-works at Otterbourne by the Hursley Board of Guardians, occupied the attention of the Court at the Hants County Quarter Sessions nearly the whole of Tuesday and Wednesday last week. The gross rating fixed by the Assessment Committee was £2385, and the net £1908. Mr. Castle, Q.C., Mr. Bullen, and Mr. Emanuel appeared for the appellants, and Mr. Balfour Browne, Q.C., and Mr. Greenwood represented the respondents. The professional witnesses called in support of the appeal included Mr. E. Ryde and Mr. Joseph Quick. Judgment was deferred to the Easter Sessions. We hope, in our next issue, to give a summary of the arguments of Counsel and of the evidence adduced.

The Northern Coal Trade.—The coal trade in the North-east of England is still strong, and the demand for steam coal is far above that usual at this time of the year; whilst the demand that has set in from Belgium, owing to the strike there, has increased the activity. The price of steam coal is steady at about 11s. 6d. to 12s. per ton, f.o.b. The inquiry for gas coal is very strong, though the local consumption is now a little less; but for two months it will be heavy, in a decreasing ratio. Prices vary very much—as high as 15s., less 2½ per cent., having been paid, whilst coal of the same quality is being delivered on contract at 6s. per ton. The export of gas coal to the Mediterranean is now likely to increase; the range of freights to that part being rather lower. There are still complaints as to the restriction of production on the part of some of the pit-men. Manufacturing coal is firm, though the consumption is less.

Fatal Explosion at the Meadow Lane Gas-Works of the Leeds Corporation.—Early last Tuesday morning, at the Meadow Lane Gas-Works, Leeds, an explosion of gas occurred, which caused the death of an engine-tenter named John Rhodes. The deceased had been employed at the works for eight years; and about two o'clock on Tuesday morning, he had occasion to go into a small room near the pump-room for oil. He had a lamp with him; and it is supposed that this set fire to some gas which had accumulated. Rhodes rushed out of the room with his clothes on fire; but one of his fellow-workmen at once came to his assistance, and put the flames out. Rhodes was removed to the Infirmary, where it was found that his head, neck, and arms were severely burnt, and that several ribs of the right side were fractured; and he died the same day from rupture of the liver. It appears that there was a tendency for fumes to collect in the room where the oil was kept; and it was generally understood that it was unsafe to go into it with a naked light, and deceased had been cautioned. An inquest was held by the Borough Coroner (Mr. J. C. Malcolm) on Thursday, when the Manager of the works (Mr. George Tooley) gave evidence. He stated that it was not necessary to take a light into the room, which was lighted from an adjoining room; and if a light had been required, a Davy safety-lamp would have been provided. The jury returned a verdict of "Accidental death," and added a recommendation that the store-room should be ventilated, in order to prevent accidents in future. Alderman Gilston, the Chairman of the Gas Committee, undertook that this should be immediately done.

The Price of Gas at Bolton.—At the meeting of the Bolton Town Council on Monday last week, a long discussion took place upon a proposal of the Gas Committee to increase the price of gas 2d. per 1000 cubic feet, from the 1st inst. The Chairman of the Committee (Mr. Alderman Miles), in moving the adoption of the proceedings of the Committee, said the members of the Council would be aware that very extensive alterations had been made in the hours and wages of the stokers in their employ, which involved an additional expenditure of £3000 per annum; and to the end of their financial year (March 25 next), they would have paid £1700 more than they anticipated. There were, besides, other applications from men in the Gas Department, which, if agreed to, would involve a still further outlay. The proposed increase in the price of gas would realize from the 1st of January to the 25th of March something like £1900, providing the consumption went on at the same rate as at present; and this would cover what the Committee would pay in increased wages. He pointed out that when they came to renew their coal contracts in March, another advance would be necessary; the price of coal having gone up considerably. If they had to pay 4s. a ton more for their coal than they were doing now, it would mean an increase of £14,000 per annum to the Corporation. This was likely to be the case; and he believed the consumers would prefer an advance of 2d. now to having 6d. put on in March. The contention of those opposed to the increase was that the present was not the time for the advance, as the Committee were sure of their coal up to March. The proceedings of the Committee were, however, confirmed.

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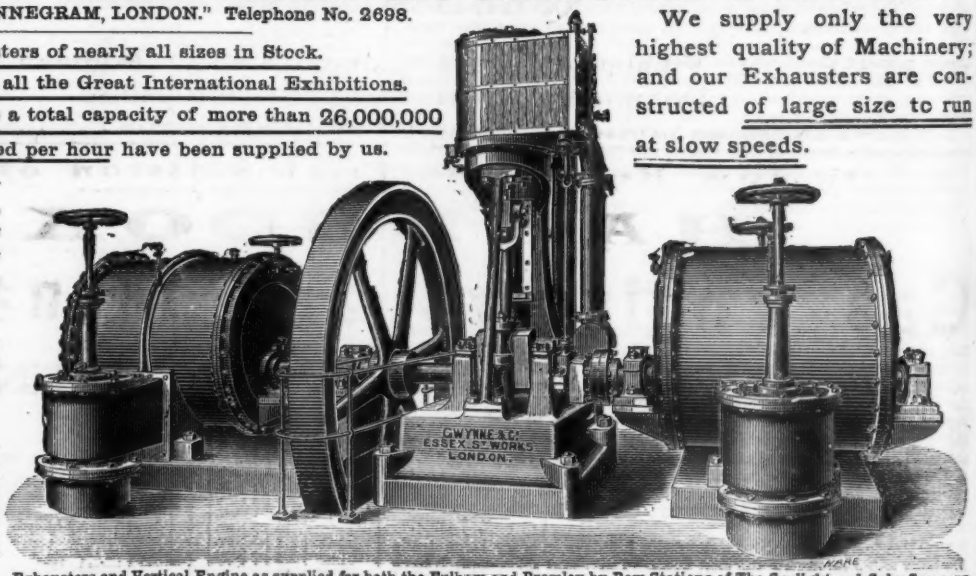

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THE Directors of the Plymouth and Stonehouse Gaslight and Coke Company are desirous of appointing a person as ENGINEER and MANAGER of their Works.
He must have a thorough practical knowledge of the Manufacture and Distribution of Coal Gas; also the Manufacture of Sulphate of Ammonia. Also to design and prepare Plans and Specifications, and carry out any new Works that may be required; and fully competent to undertake and direct the general Superintendence and Management of the Works, and devote the whole of his time and attention to the service of the Company.
The salary will be £350 per annum to commence with.
He will be required to reside on the Works, where a House, with Gas and Coals, will be provided.
Applications, endorsed "Engineer and Manager," stating age, qualifications, and enclosing testimonials as to character and ability, to be sent to the Secretary, on or before the 21st day of January, 1890.
By order,
JNO. THOMAS, Secretary.
Gas Offices, Plymouth Dec. 20, 1889.

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MESSRS. ROBINSON & SON are in- structed by the Directors to Offer FOR SALE by PUBLIC AUCTION, in Lots, at the Corn Exchange, Kettering, on Friday, Jan. 10, 1890, at Six o'clock in the Evening precisely, pursuant to the provisions of the Kettering Water-Works Act, 1889 (under which all new Shares are to be offered for Sale by Auction or by Tender before being offered to the existing Shareholders), 1000 NEW ORDINARY SHARES of £10 each in the above Company, part of an additional Capital authorized to be raised for the purposes of New Works now in course of construction, and which have been rendered necessary by the constantly increasing demand for the Company's Water, consequent upon the extraordinarily rapid growth of the Population and Industries of the Town.

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THE Directors are prepared to receive TENDERS for a set of PURIFIERS, 30 feet by 25 feet, complete, according to Drawings and Specification which may be seen at the Office of the Company, Northampton, on and after Monday, the 20th inst.

Copies of the Specification, and Form of Tender, may be had on payment of One Guinea, which will be returned on receipt of a *bond fide* tender.

Copies of the Drawings may be had on payment of the cost.

Tenders, addressed to the Chairman, to be delivered at the Office of the Gas Company, on or before Tuesday, Feb. 4.

The Directors do not bind themselves to accept the lowest or any tender.

By order.

Gas-Works, Northampton, Jan. 6, 1890.

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THE Directors of the Burgess Hill Gas Company, Limited, invite TENDERS for about 8000 Gallons of 6° Twaddle LIQUOR.

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THE Hindley Local Board are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, &c.

For particulars, apply to Mr. Dickinson, Gas and Water Manager.

Sealed Tenders to be sent to the undersigned not later than Jan. 20.

By order,
STEPHEN HOLT, Clerk.

Offices: Cross Street, Hindley,
Jan. 3, 1890.

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Contract No. 12.—Station Meter and Bye-Pass.
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Contract No. 14.—Ten Tons Wagon Weighing-Machine.

Copies of the Specifications and form of Tender may be obtained from me, the undersigned, or from Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Sealed and Endorsed Tenders to be addressed to the Chairman of the Gas Committee, and sent so as to reach me not later than Twelve o'clock noon on Wednesday, the 15th inst.

The Board do not bind themselves to accept the lowest or any Tender.

By order,
J. W. BELLAMY, Clerk.

Local Board Offices, Rawmarsh,
Jan. 2, 1890.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the TRANSFER BOOKS of this Company, so far as they relate to the Company's Capital Stocks, will be closed on the evening of Tuesday, the 7th day of January next, and be re-opened immediately after the Half-Yearly Meeting of the Company, to be held in the month of February next.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road, Westminster, S.W., Dec. 30, 1889.

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Chemist and Superintending Gas Examiner to the London County Council.

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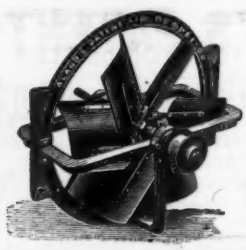

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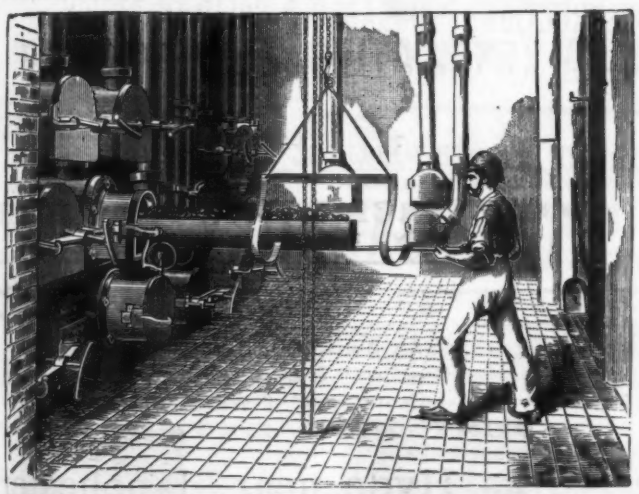

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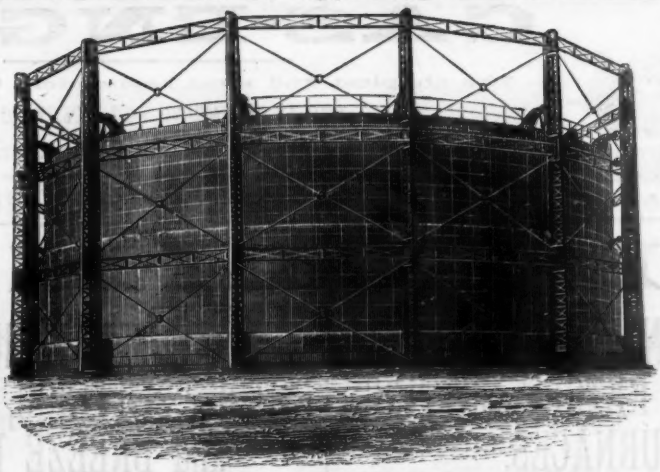

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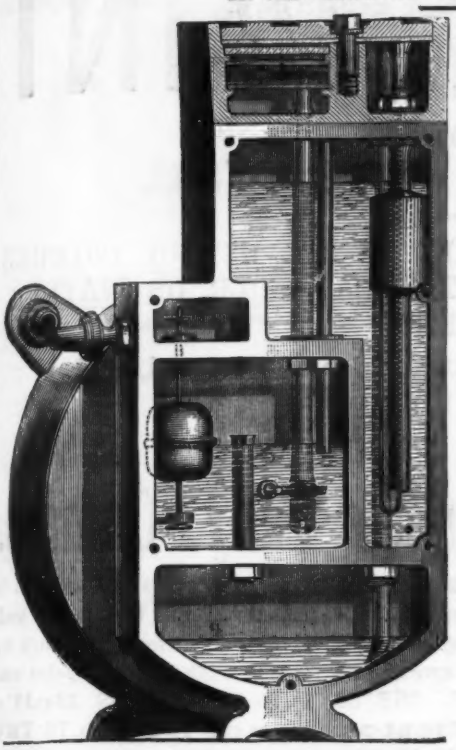

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No. 1. Flange Valve.

NO SLIP.

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IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
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No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

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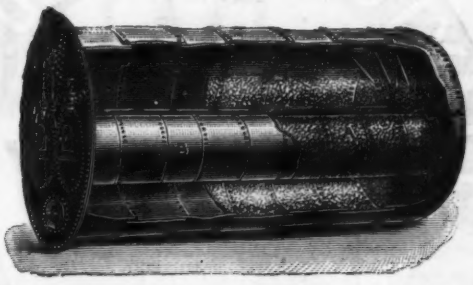
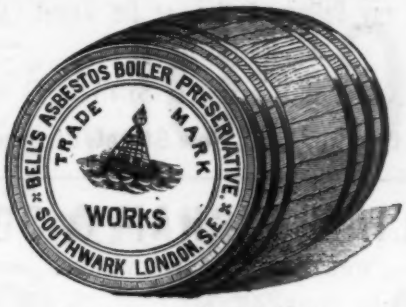
Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

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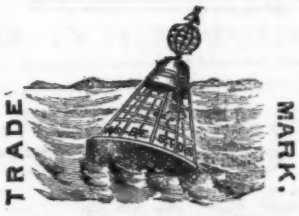

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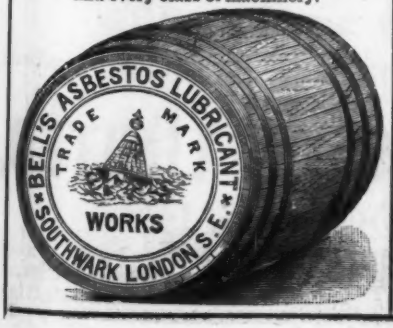
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

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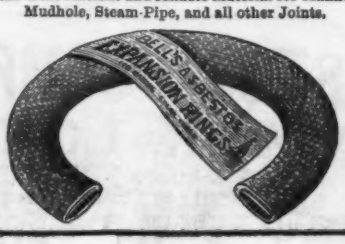
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



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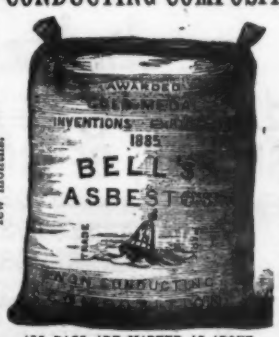
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



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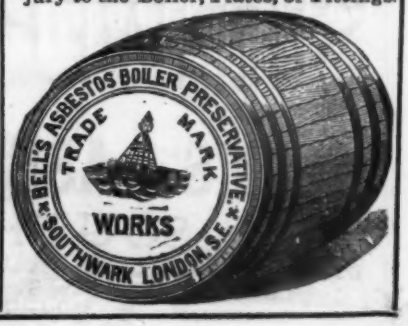
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

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To suit all sized sections of Retort. Over 70 stock sizes. Largely used in England.

Grice's Patented Stoking Machinery.

Made to suit large or small Gas-Works. The one machine draws the spent coke and recharges the Retort at one operation. Self-contained; working from engine on base or by hand. Price and particulars on application.

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As supplied to the English Railway Companies.

MORTAR & LOAM MILLS,

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Of all Kinds.

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OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

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REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from 8 PENCE to 15 PENCE per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by **Wire Rope, Steam, or Compressed Air.**—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of CIRCULAR, OVAL, or ⌂-shaped MOUTHPIECES, with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

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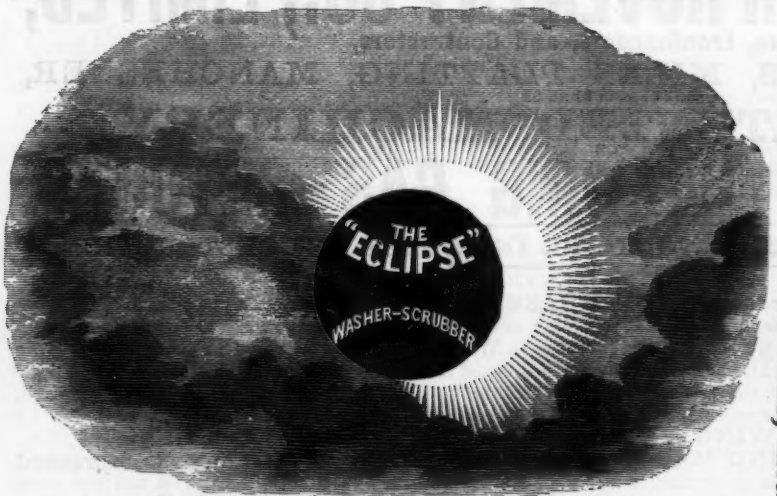

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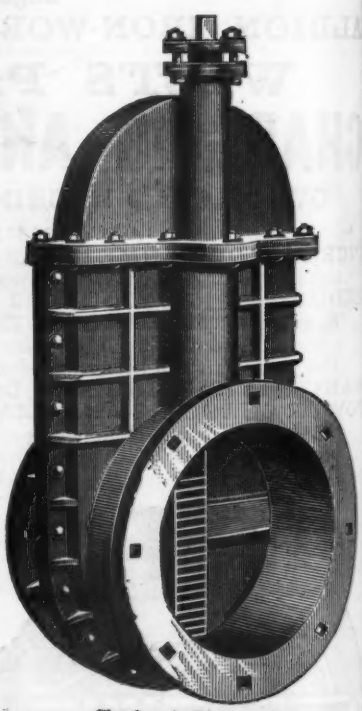
SILVER MEDAL, Inventions Exhibition, 1885.



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